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DESCRIPTIONS OF TYPES OF PRINCIPAL AMERICAN VARIETIES OF ONIONS

Prepared Jointly by Specialists of the
United States Department of Agriculture
Massachusetts State College
and the Experiment Stations of
California, Ohio, Texas, and Utah

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UNITED STATES DEPARTMENT OF AGRICULTURE
MISCELLANEOUS PUBLICATION NO. 435

Washington, D. C. September 1941

DESCRIPTIONS OF TYPES OF PRINCIPAL AMERICAN VARIETIES OF ONIONS

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INTRODUCTION

This publication is the seventh of a series dealing with descriptions of types of the principal varieties of vegetables grown in the United States. It is published in response to the needs of seedsmen, produce merchants, vegetable canners, and growers for an adequate, accurate, and generally accepted description of varietal characteristics. The sustained interest, generous cooperation, and constructive criticisms of these groups have immeasurably helped the Department and the cooperating State experiment stations in initiating and carrying forward this work. The authors gratefully acknowledge the assistance given them by the abovementioned agencies and by their colleagues and associates.

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[1] The names of the joint authors who collaborated in the several States are listed according to the alphabetical order of the names of the cooperating institutions as a matter of convenience, as it is not possible to list them in any order of rank or seniority. This publication represents the joint efforts of all the authors, aided by the criticisms and suggestions of the various agencies referred to herein.

OBJECT AND RESULTS OF TYPE STUDIES

As the title suggests, the object of this publication is to describe, as accurately and definitely as possible, the general form or structure of the most important varieties of onions (*Allium cepa* L.) grown in the United States in 1938. Insofar as possible, information is also given on the relative importance of varieties for specific purposes and geographical regions, on their resistance to diseases and insects, and their reaction to different environments.

Because the better plants were selected for description and illustration, these descriptions are somewhat idealistic and, in that sense, a standard of perfection to be sought, rather than a description of the better stocks as they existed at the time this work was done. Photographs of random samples from the most uniform stock of each variety available are presented to indicate the nature and degree of variation between it and the type or standard description.

It is hoped that these descriptions may serve as a standard for varietal identification, classification, and nomenclature. Such a catalog of characteristics of the principal or standard varieties should prove of value in many ways to all persons interested in the crop, from the seed producer to the vegetable consumer.

Provided with a knowledge of the salient features of each variety, the ultimate user, seedsman, canner, grower, or shipper will be able to intelligently determine the best variety for his particular needs. This intelligent selection should tend to concentrate demand on the most valuable varieties and to reduce the demand for inferior ones, resulting in the gradual elimination of the latter from the trade. The local seed merchant could soon reduce his list of varieties to those best suited to his locality and thereby eliminate a number of unprofitable items from his catalog and his store. Reduction in number of varieties would also enable the seed producer to devote more time and attention to the comparatively few important varieties, with consequent improvement in the quality of commercial stocks.

By making it possible to identify or classify varieties by reference to a standard variety or type, the practice of renaming standard varieties or substituting other varieties with incorrect labeling should be discouraged. If all stocks of a given variety name conform to the standard or type herein described, the buyer can order by name with confidence that the desired type will be secured. It is highly desirable to establish such confidence. The introduction, acceptance, and use of valuable new varieties and strains may be facilitated by indicating their points of difference from or superiority over the standard variety that they resemble most closely. Plant breeders will also be interested in the ensemble of characters that constitute the principal varieties and may have direction given to their efforts by a study of the importance of different characteristics.

Acceptance of these descriptions as type standards and attainment of the desirable objectives outlined above is entirely dependent upon the voluntary action of everyone concerned. The intense interest exhibited in the work and the splendid spirit of cooperation evidenced on all sides augur well for speedy consummation of the informal cooperation necessary to achieve those objectives.

SUPPLEMENTAL VARIETAL DESCRIPTIONS CONTEMPLATED

With the initiation of a comprehensive disease and insect resistance breeding program on onions by the Federal and cooperating State experiment stations, the introduction of new strains or varieties of onions resistant to one or more of the common pests may soon be expected. If, in the future, these new disease and insect resistant varieties, as well as other new introductions, are sufficiently different and important enough to warrant principal status, it is planned to issue a separate publication describing the new types.

To warrant a new varietal name, the plant introduced should be different in one or more easily recognized or easily determined characters and, preferably, should contain some characteristic of superiority over existing varieties. Mere difference in a minor character should not be considered sufficient reason for a new name or for perpetuating the new stock or strain.

On the other hand, a new and distinct improvement should be recognized as such by giving the introduction a new name, rather than by gradually substituting it under the name of a standard variety, a practice that invariably leads to confusion and distrust.

It should not be inferred that this list of principal varieties meets perfectly all the possible requirements of the trade. A careful study of the descriptions will reveal the desirability of many improvements in the present varieties that can and probably will be made in future varieties. Rather than impede progress in the development of new varieties, an unbiased catalog of characters should stimulate the production of better varieties by establishing the standards with which they may be compared and by pointing out the strong and weak points of the present varieties.

METHODS OF PROCEDURE

The following descriptions are based upon the results obtained from two crops grown at Amherst, Mass.; Arlington Experiment Farm, Arlington, Va.; Winter Haven, Tex.; Davis and Terminus, Calif.; Farmington, Utah; and McGuffey and Columbus, Ohio.

The manuscript and figures were critically reviewed by all collaborators and also by most of the major American onion breeders and seed producers. As the descriptions are based on actual stocks in existence at the time this work was done, the acceptance by this group most qualified to judge should be sufficient authority for establishing these as standards or type descriptions for the principal varieties. Although it is true that all of the plants of any stock of any variety did not meet the standard herein described, the percentage that did attain the standard was sufficiently high in the better stocks to be commercially acceptable, as shown in the illustrations of random samples. The task of determining the intended type was, therefore, relatively easy.

The list of varieties in this report, Australian Brown, California Early Red, Crystal Wax, Early Grano, Early Yellow Globe, Ebenezer, Italian Red, Mountain Danvers, Ohio Yellow Globe, Red Creole, Red Wethersfield, Southport Red Globe, Southport White Globe, Southport Yellow Globe, Brigham Yellow Globe, Sweet Spanish, White Sweet Spanish, White Creole, White Portugal, Yellow Bermuda, and Yellow Globe Danvers, includes all those constituting between 85 and 95 percent of the total of onion seed sown in the United States, according to reports submitted by seed growers and dealers. This list also includes the major types grown in all sections of the United States even though the volume of seed used may be relatively small. For instance, the Creole onions are of major importance in the region about New Orleans, but the volume of seed handled through commercial channels is very small, due partly to the fact that many of the bulb growers also produce their own seed and sell any surplus to their neighbors.

Seed of the best available stocks of these varieties was requested from American seed growers through the Vegetable Research Committee of the American Seed Trade Association. The same seed was used by all collaborators and, after the first year, the observations and measurements were made on the same strain of each variety according to a uniform system previously agreed upon by the workers in the various locations.

The choice of a name has been influenced by priority, descriptiveness, brevity, and popularity or use. In cases where names for these varieties now used in seedmen's catalogs differ from these standard names, it is suggested that the old name be enclosed in parentheses following the standard name in order to acquaint the purchasers with the change in name. After a few years' use, listing of the old name may be discontinued.

Synonyms were obtained from Field Notes on Onions (*58*),[2] United States Department of Agriculture, Bureau of Plant Industry Bulletin 21 (*69*), unpublished Bureau of Plant Industry records for 1921, and from the catalogs and trial ground records of American seedsmen. No attempt was made to determine the synonymy of names appearing in the hundreds of retail seedsmen's catalogs, nor to determine the correctness of the synonyms from the above-mentioned sources.

Every effort was made to provide optimum growth conditions at the different locations by the use of proper fertilization, irrigation, and cultural methods. Plants were spaced 3 or 4 inches apart in the rows with ample space between rows for uncrowded development of the foliage.

In order to obtain good stands of plants, transplants were grown at all locations. At Amherst, Mass., Arlington, Va., Farmington, Utah, and McGuffey and Columbus, Ohio, the seedlings were grown during the winter and early spring in greenhouses and coldframes and set in the field as soon as possible (March and April). At Winter Haven, Tex., the seedlings were grown in the field in plant beds during the fall and set in the field in November or December. At Davis, Calif., the intermediate varieties were handled as in Texas and the other varieties were seeded in coldframes in late fall and transplanted to the field in early spring.

It is felt that the range in environmental conditions was sufficiently wide, considering the different locations and seasons in which the crops were grown, to provide a fair sample of the weather conditions under which onions are grown in the United States.

Detailed notes, measurements, and color readings on the plant, leaves, and sheath column were made on 50 typical specimens at the stage of greatest vegetative development, i. e., just before the tops fell over or started to turn yellow.

Plant height (the distance from the soil surface in the row between the plants to the highest point reached by any of the foliage) was measured in the morning when the foliage was turgid.

Leaves were straightened out for measurement of length; width was measured at midlength; depth was also measured at midlength at a right angle (90°) to the plane of width measurement.

Sheath column length or height was measured from the soil surface to the base of the lowest succulent leaf. Diameter was measured at midlength.

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[2] Italic numbers in parenthesis refer to Literature Cited, p. 94.

The crop was considered mature and was pulled when the tops of approximately 75 percent of the plants had fallen over or turned yellow.

The pulled plants were allowed to dry in the field for a few days and then placed in crates to complete the curing process under cover. As soon as the tops and roots were completely dry, they were cut off about one-half inch from the bulb, the old dirty scales rubbed off, and detailed measurements, notes, and color readings made on 50 of these cleaned typical bulbs. In 1934, the notes and measurements were secured on a random sample of approximately 150 bulbs of each variety at several locations.

Bulb depth was measured from the junction of root plate with the scales to a point on the upper half of the bulb where the neck curvature changed from convex to concave, or in the case of tapered upper half bulbs, at a point where succulent scales ended.

Bulb diameter is the greatest distance between opposite sides, i. e., at right angles to depth.

After the external bulb characteristics were recorded, the bulbs were cut at midlength and the internal characters studied.

Color readings were made of typical plants and bulbs in a laboratory under light from a north window several times during the growing season and during the storage life of the bulbs. A record was also made of the variation in bulb color within the variety. The color plate is based on freshly cleaned bulbs.

Storage quality and bulb scale retention are based on storage tests conducted at each of the five locations (*55*).

Photographic records were also obtained wherever possible. Although all the photographs could not be published, the random sample photographs from California and Virginia were very useful in preparing the type descriptions and the discussions of the effect of environmental factors on varietal characteristics and on the developmental history of shape.

In addition to the characters herein reported that have diagnostic value, a number of other characters were studied in which the varieties discussed did not differ or in which the differences were so inconstant or fluctuated so little at the different locations as to be valueless from a systematic standpoint. Characters of no diagnostic value were: Plant spread, blade direction, blade cross-section shape, size or shape of tip or end of blade, root number, root size, root color, root plate diameter, number of growing points at middepth of bulb, number of inner fleshy scales, color of fleshy scales with the colored epidermis stripped off, and uniformity of ripening.

IMPORTANT CONSIDERATIONS IN COMPARING ONION VARIETIES OR STRAINS WITH TYPE DESCRIPTIONS OR STANDARDS

Because the greatest value of these descriptions will probably be as a standard by which to judge or compare new or commercial varieties or strains of onions, great care should be taken to provide proper conditions for valid comparisons.

Cognizance should be taken of the variations to be expected, as pointed out in the section on the effect of the environment.

Two or more strains of several standard varieties should be included in the test plots to serve as a measure of the variation produced by the particular set of growth conditions encountered.

All strains to be compared should be planted on the same day and given identical cultural conditions most likely to lead to the production of a good commercial crop. The plot or field selected should be as uniform in soil type and fertility as possible, and sufficient fertility should be provided for normal growth.

Two or three rows, each 20 to 30 feet long, located in various sections of the plot are likely to give more reliable comparisons than a single, longer row. Where a critical comparison of yield is desired, plots of sufficient size and number should be so arranged that the results may be analyzed statistically.

Plants should be given sufficient space for normal development and thinned to a uniform distance when small. Aisles should be provided between the different blocks or short rows for ease in studying development and to avoid injury to the growing plants.

At least 100 normally developed plants should be available for study and, wherever possible, actual measurements and color readings should be the basis for comparison. Counts of the misshapen or offtype plants (not typical of the variety in which they occur) and a brief description of the offtype or unusual plants should also be included in the report or characterization of the stock, strain, or variety being tested.

The designations of color values used in this publication refer to A Dictionary of Color (*50*), and care should be used to follow the directions given therein in matching specimens with the color plates. The color readings on the outer intact dry scales should be taken soon after curing and cleaning. Bulbs 1 or more months after cleaning will generally be more brown or duller in color than the reading on the color plate for a variety given in this publication. (See pl. 1 at end of this publication.)

Obviously, all characteristics of the plant should be carefully studied and considered before attempting identification or characterization. Most onion varieties differ in more than one character and yet it may be necessary to have observations on plant, maturity, bulb, and storage performance characters in order to identify certain varieties.

INFLUENCE OF ENVIRONMENT ON VARIETAL CHARACTERS

In the varietal study it is important to know the direction and extent of the possible variations in varietal characters that may be produced by different environmental factors. Daily fluctuations in the different factors of the environment make it extremely difficult to accurately determine the value or influence of any given factor in experiments conducted under field conditions. For that reason the following discussion is largely based upon the results of experiments conducted under controlled conditions by other workers where the effect of a given factor or combination of factors could be determined.

These observations may be helpful in explaining the different behavior of the same strain or variety in different locations or in different seasons. In most instances the experiments were conducted with a single variety, and it is not known whether all varieties react in the same manner to the same change in environmental factors.

Only brief summaries are given, as readers interested in the details of the experiments may consult the original articles cited. The list of references is not complete and only the more recent and still available publications are included.

INFLUENCE OF ENVIRONMENT ON FOLIAGE SIZE

The size of the top or foliage of the onion plant is greatest about the time the bulb starts to form (enlargement of the base) under conditions favoring the development of a mature dormant bulb. The size of the matured bulb is also closely correlated with the size of the foliage or top at the time bulb formation starts, provided maturing proceeds normally (*26*, *27*, *32*, *72*). The influences of environmental factors on foliage size are therefore essentially the same as those on bulb size discussed on page 7.

INFLUENCE OF ENVIRONMENT ON FOLIAGE COLOR

Since the foliage of normally maturing onions gradually turns yellow and dries up as maturity of the bulb is reached, the influence of environmental factors on foliage color must be studied before this normal change takes place. Attention is therefore directed to the discussion of environmental effects on maturity. Aside from this normal change in color with maturity, a number of environmental factors have an effect on foliage color. Very acid soils may soon cause the death of seedlings, and if dry sets are used they may grow well only for a short time after which growth slows down, the tips of the older leaves turn yellow, and finally the entire leaf collapses and dries up (*30*, *39*). A deficiency of magnesium results in similar appearance (*8*) with premature browning of the tips of the leaves. On soils that are not too acid and not deficient in nitrogen, potassium, or magnesium, a deficiency of phosphoric acid results in lighter green color than that of completely fertilized plants (*67*). Nitrogen-starved plants are also light green or yellowish green in color and erect in habit (*76*), whereas potassium-starved plants have dark-green erect leaves whose tips soon turn brown and wither (*9*, *14*). Wet, cold soils or excessive irrigation produces the same symptoms as nitrogen starvation (*21*, *27*).

Slowing down of growth due to temporary periods of water shortage or lower temperatures increases the amount of bloom on the leaves and therefore makes the plants grayer or bluer green in appearance.

Yellowing of the tips and rapid death of the leaves are symptoms of attack by mildew, fusarium rot, and white rot. Yellowing of the leaves and stunting of the plant are symptomatic of root knot, yellow dwarf, and pink root. A whitening or silvering of onion foliage is caused by feeding damage of thrips, a very small, pale-yellow insect (*29*, *70*).

INFLUENCE OF ENVIRONMENT ON BULB FORMATION AND MATURITY

When grown in the South during the fall and winter or in the northern part of the United States in greenhouses during the winter, no bulbs are formed. A certain number of hours of light each day (day length) is necesary for bulb formation (*19*, *48*, *54*). The minimum day length for bulb formation varies for the different varieties (*54*) and is affected by the growing temperature. Temperatures between 50° and 60° F. have inhibited bulb formation and between 70° and 80° greatly accelerated it, at favorable lengths of day (*68*). Plants grown in water cultures at unfavorable pH levels formed bulbs sooner than those grown at pH levels most favorable for total growth (*75*). Analyses of onion plants at various stages of development show that "initial bulbing results from the accumulation of sugars in all parts of the plant," "soil moisture limits the total amount of growth but apparently does not influence the time of bulbing," and "large quantities of soil nitrates tend to delay bulb formation and to reduce yields" (*76*). A marked deficiency of potash also inhibits bulb formation (*14*).

The attainment of maturity, i. e., the cessation of new foliage and root growth with the subsequent softening, shriveling, and collapse of the tissues of the neck and death of the roots usually requires a longer day length than does the start of bulb formation (*54*), and increasing the length of day hastens maturity (*4*, *48*, *54*, *75*). Either increasing the temperature at which the plants are grown or a period of low temperature followed by high temperatures hastens maturity over that of growth at continuous high or low temperature (*68*). Low temperatures after bulb formation has started tend to delay maturity (*56*). Plants grown at high altitudes mature later than those at lower altitudes at the same day length, but this may be the result of lower temperatures at the higher altitudes (*18*).

Although temperature and length of day are important factors in bulb formation and maturity, the size or age of the plant at the time the minimum length of day for bulb formation is reached must also be an important factor, as late seeding or late planting delays date of maturity (*21*, *32*, *67*, *74*); plants 10 to 12 weeks old mature sooner than seed sown the same date the plants are set (*66*); plants from dry sets (bottom sets) mature sooner than green plants or seed (*16*, *39*, *56*, *66*); plants from large dry sets mature earlier than those from small sets (*39*, *67*).

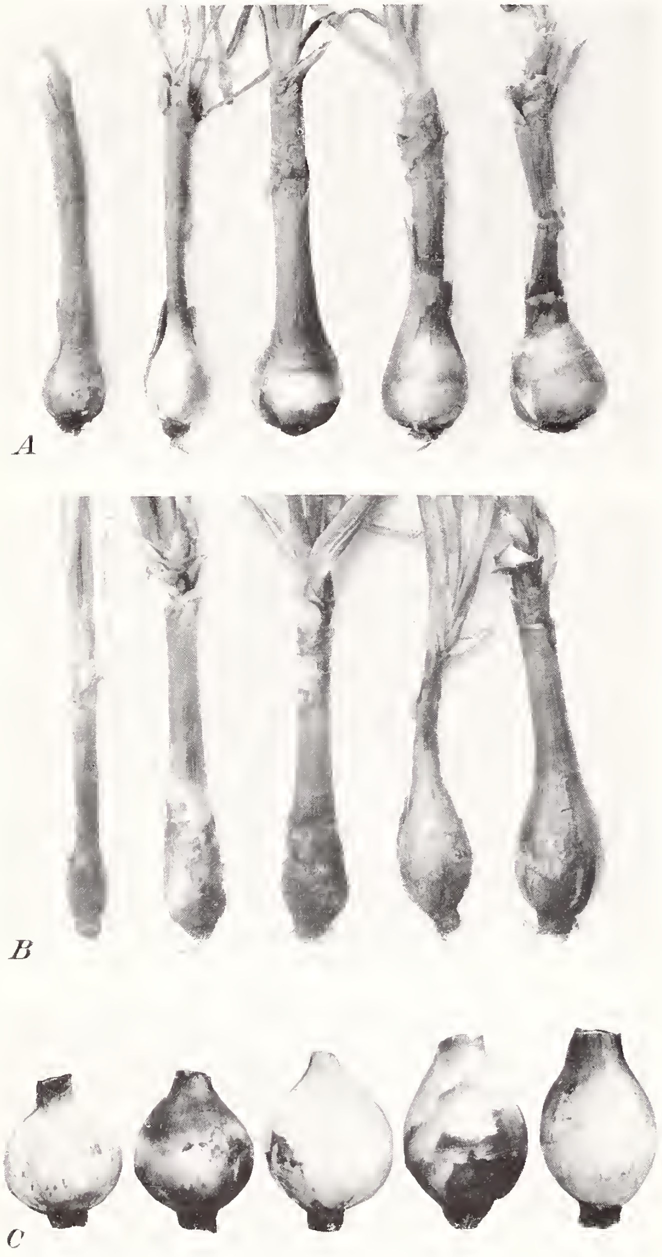


FIGURE 1.—The range in degree of bulb development of *A*, Ebenezer; *B*, Southport Red Globe; and *C*, the larger bulbs of Sweet Spanish onions harvested between the first and middle of July from seed sown August 23 at Winter Haven, Tex. The percentage of large bulbs was very small, and none of them were commercially acceptable.

Trials conducted at Winter Haven for 3 years showed that only those varieties that matured their bulbs by about April 15 to May 15 (Crystal Wax, Yellow Bermuda, Early Grano, Red Creole, and White Creole) were able to make a commercially acceptable crop of bulbs. The varieties commonly grown in the northern onion-growing sections for storage started to form bulbs but the necks never ripened down properly, as shown in figure 1. The minimum length of day for bulbing (13 hours) for these northern varieties is reached about April 20 at Winter Haven. By this date, however, temperatures are high and have promoted the rapid increase of thrips and pink root and other root diseases to such an extent that continued increase in size of the bulb is impossible. The early maturing varieties mentioned above (those that can form bulbs at shorter day lengths) escape the detrimental effects of high temperatures and the most severe damage from insects and diseases (*53*).

Other cultural practices that favor early maturity are thick seeding (*21*, *32*, *39*, *74*) in the row or close spacing of rows (*39*, *77*), compact muck soil as contrasted with a loose fluffy condition (*21*), shallow planting (*21*, *56*), planting on ridges or beds rather than in level fields (*56*), sufficient water to prevent checking growth and avoiding an excess in irrigation (*56*), or the prevention of too low or too high a water table in the case of muck or peat soils and prevention of wind injury to growing plants (*21*). Under Texas conditions (*56*) deep cultivation is reported to hasten maturity, whereas in Michigan on muck lands (*21*) it is said to delay maturity. In Montana light root pruning of well-bulbed plants did not hasten maturity, but heavy root pruning, which caused the tops to wilt, seemed to hasten maturity (*66*).

The type of soil and nutritional level at which the onion plant is grown also has a marked effect on the date of maturity or the percentage of mature bulbs. Light sandy soils result in earlier maturity than heavier soils (*56*). Very acid (*73*) and very alkaline soils usually cause slow growth and late maturity. The addition of lime and copper sulfate to acid soils and of sulfur and manganese sulfate on alkaline soils has been effective in increasing the percentage of mature bulbs (*22*, *39*).

The proportion of nitrogen, phosphoric acid, and potash to apply to the soil for highest percentage of maturity is influenced by the soil type, reaction, age, previous fertilization, drainage, and the variety and date of planting (*9, 26, 39, 44*). A deficiency of any of these three or any other essential element is liable to result in small improperly matured bulbs (*76*). Increasing the proportion of phosphoric acid to potash hastens maturity and therefore would be advisable on late plantings, on late-maturing varieties, and on very acid or alkaline or on poorly drained soils (*21*).

Nitrogen in small quantities has increased the percentage of mature onions on certain muck soils (*21*) and on nitrogen-deficient soil mixtures (*76*). In nitrogen-starved plants the neck does not soften or collapse but remains rigidly erect and the roots remain alive and in good condition longer than plants receiving an adequate amount of nitrogen (*76*). High content of soil nitrate nitrogen on the other hand has also been associated with failure to produce mature bulbs (*77*). Delayed or split applications of nitrogen have resulted in more immature bulbs than when all the nitrogen was applied before planting.

The more readily soluble phosphate carriers produced fewer immature bulbs than the slowly soluble carriers (*21*). Under certain conditions manure has hastened maturity more effectively than chemical fertilizers (*9*). Copper sulfate applied on a New York muck soil has slightly delayed maturity (*43*).

INFLUENCE OF ENVIRONMENT ON BULB SIZE

The size of the mature bulb is closely correlated with the size of the plant at the time bulb formation starts, and, therefore, would be influenced by any factor or factors that influenced plant growth before this period in the life cycle, as well as during completion of the bulbing and maturity process.

Cultural factors favoring the attainment of large bulb size are: Early planting (*22, 32, 40, 60*); increased space per plant (*27, 40, 74, 80*); elimination of weeds while still small; prevention or avoidance of damage from blowing soil particles, diseases, or insects and other pests (*13, 22, 70*); provision of adequate soil moisture by irrigation for quick resumption of growth following transplanting (*27*) and for continuous growth until bulb development has been almost completed (*11, 12, 16, 17, 45, 67*); avoidance of too high a water table under the growing crop (*18, 22, 27*); growing after a crop that has no detrimental residual effect on onions (*24, 39, 49*); soil reaction between pH values 6.0 and 7.0 (*9, 15, 21, 24, 30, 39, 73, 75*); ample supplies of available magnesium (*8*), manganese (*15, 20, 22, 23*), copper (*15, 22, 44*), calcium (*2, 39*), and the optimum quantities and proportions of nitrogen, phosphoric acid, potassium, and other essential elements (*3, 7, 9, 14, 15, 18, 21, 23, 26, 27, 40, 44, 46, 59, 67, 76*).

Dry sets usually produce larger bulbs than seeds do when seeds and dry sets are planted at the same time and thinned to the same stand (*66*). Size of the harvested bulb is usually correlated with size of set planted when the sets have been stored at 30° and 32° F. (*67, 68*).

Transplants also usually produce larger bulbs than seed sown in the field on the same date the transplants are set. The largest increases from the use of transplants over seeding in the field are from late-maturing large-bulb varieties (*22, 66, 80*).

When green plants are transplanted into the field, larger bulbs are produced by unpruned plants compared with those in which a portion of the foliage and roots have been removed (*27, 72*); by early transplanting in regions, or with varieties, where doubling, splitting, or seed stems are not a factor (*27, 32*); by the use of large-sized plants rather than small (*27, 32, 72*); by plants grown in a cool rather than a warm greenhouse (*66*); by planting 1½ inches rather than 3 inches deep (*66*), and by wider spacing in the row and between rows (*27, 32, 66, 80*).

High soil temperatures are not only detrimental to the growth of young onion plants (*71*) but when continued, result in smaller mature bulbs than lower temperatures. Greenhouse experiments (*68*) show that bulbs grown continuously at 70° to 80° F. are smaller than those grown at 60° to 70°. Bulbs were larger from plants grown for 30 days at 40° to 50° and then grown to maturity at 70° to 80° than those grown for 30 days at 60° to 70° and then grown to maturity at 70° to 80°.

INFLUENCE OF ENVIRONMENT ON SEEDSTALK FORMATION

Onions grown from seed planted in the spring in the northern onion-growing sections rarely produce seedstalks the first year, but where dry sets are used or where seed is sown in the late fall and the plants are set and grown in the field during late winter and early spring in sections where this is possible, the percentage of seeders sometimes is high enough to materially reduce yield and quality.

To hold the percentage of seeders to a minimum, dry sets should be stored at 30° to 32° F. (*68*) and when not stored at this temperature range, only the smaller sizes should be used, as the percentage of seeders increases as the diameter of the set increases (*1, 67, 68*). After the sets are planted in the field an extended period of temperatures between 50° and 60° or lower is necessary for seedstalk formation, whereas continuous temperatures above 70° inhibit seedstalk formation (*37, 52, 57, 68*).

In the case of seedlings or green plants, the larger the plant at the time low temperatures occur the higher the percentage of seeders (*12*, *27*, *33*). Seasons with a warm fall and cool spring produce more seeders in California than the reverse kind of season (*35*), and localities with the lowest average temperature during the growing season have the highest percentage with a decrease as the average temperature rises (*36*).

The action of the above-discussed environmental factors is also limited by the genetic constitution of the strain or variety. Varieties differ in their seedstalk-producing ability under the same set of conditions (*35*), and breeding work has shown that this unfavorable character may be largely eliminated (*28*, *36*).

INFLUENCE OF ENVIRONMENT ON SPLITTING AND DOUBLING OF BULBS

Varieties and strains are known to differ genetically in the percentage of split and double bulbs, but environmental factors also play a very important part in their formation.

Thin stands or wide spacing of plants in the row increases the amount of splitting and doubling over thick stands or close spacing in the Sweet Spanish variety (*77*). When plants are set out at uniform distances the fertilizer treatment that results in the largest yield is also likely to result in the largest percentage by weight of doubles (*26*). The setting of large plants results in more doubles than the use of medium or small plants (*27*). Setting the plants 1½ inches deep leads to more doubles than planting them 3 inches deep (*66*). Allowing the seedlings to remain too long in the seedbed favors the production of doubles and splits (*56*).

Large plants that suffer a serious check in growth caused by cold weather, insufficient moisture, and fertility, and are then stimulated into active growth by fertilizer side dressing, irrigation, or warmer weather are liable to produce more doubles and splits than if growth proceeds at a uniform rate, especially if the check comes after bulb formation has begun (*25*, *56*). Killing back of the tops of large, vigorously growing plants to the ground line may result in the formation of "multipliers," an extreme form of splitting, i. e., a large number of growing shoots instead of the usual two or three may be formed (*52*).

When the dry or bottom sets are used for planting, the percentage of doubles and splits is largest from large-size sets and smallest from small sets (*1*, *68*), largest from fertilizer producing the largest size bulbs (*1*) and largest from the storage temperatures that produce the fewest seedstalks (*68*).

Continued growth at day lengths and temperatures unfavorable for normal bulb formation and maturity also results in doubling and splitting (*48*).

INFLUENCE OF ENVIRONMENT ON BULB SHAPE

In loose sandy or muck soils, bulbs may be grown thickly in the row without deformation, but in mineral soils and especially in the heavier types the bulbs may become flat-sided or top-shaped if they grow too closely in the row. Transplanted plants had a smaller percentage of misshapen bulbs under Texas conditions than nontransplanted plants of the same age. When sown a month later than the transplanted plants, the percentage of misshapen bulbs was reduced (*27*). Under Montana conditions, setting the young plants 3 inches deep resulted in a larger percentage of deformed and round or oval-shaped bulbs than setting 1½ inches deep of both the Southport Yellow Globe and Riverside Sweet Spanish varieties (*66*).

INFLUENCE OF ENVIRONMENT ON SCALE COLOR

Rain during the curing period tends to produce a dull dingy surface on all colors and, if excessive, tends to fade the outer scales of the yellows and reds. If handled when wet the soil will discolor them. White onions must be protected from sunburning and greening during curing, and it is sometimes advisable at the last cultivation to throw a little soil over the developing bulb to protect it from the sun. Covering Ebenezer bulbs grown from sets with soil in Massachusetts results in darker scale color. Yellow onions also take on a greenish cast if exposed to frequent rains during curing, or may become bleached by hot dry air when immature or moist. The scale that dries down in storage is frequently better colored than that which dries down very quickly in the field. Overhead- or sprinkler-irrigated yellow onions grown in Iowa were reported to be better colored than those not irrigated (*17*).

The color of Sweet Spanish onions on Fort Collins clay loam soil was materially darkened by the addition of phosphoric acid and lightened by the use of potash and also by manure, as compared with the unfertilized plot (*3*). The use of potash in addition to nitrogen and phosphorus on unfertile acid sandy loam soil in Poland also produced lighter colored yellow bulbs than where it was omitted (*9*). On certain acid muck soils of Michigan, Indiana, and New York (*15*, *22*, *41*) the addition of copper sulfate to other fertilizers on acid soils and the addition of sulfur and manganese sulfate to alkaline mucks have resulted in a darker color of both yellow and red varieties. Large quantities of superphosphate on certain muck soils have improved the color of Yellow Globe onions (*41*).

Yellow onions stored at relatively high temperatures develop a deeper or darker yellow color than onions stored at low temperatures (*31*). A sudden change in storage from yellow to brown blotches or uniform brown, from red to deep greenish black or metallic black, or from clear white to greenish yellow may be due to ammonia fumes from a leaking ammonia-refrigerating system (*64*).

Red varieties maturing under low temperature are much more deeply colored than those maturing under high temperatures. This is especially conspicuous when comparing varieties like California Early Red and Lord Howe Island that have grown to maturity under the cool coastal conditions in contrast to those that have been grown in the hot interior valleys of California.

INFLUENCE OF ENVIRONMENT ON SCALE THICKNESS

The addition to certain muck lands of copper sulfate (*42, 43*) and of large quantities of superphosphate (*41*) has measurably increased the thickness of dry onion scales or skins. On an acid soil with low organic-matter content the omission of potash from the fertilizer and the omission of all fertilizer resulted in the thinnest scales, whereas the thickest scales were obtained from the plot receiving lime in addition to nitrogen, phosphoric acid, and potash (*9*).

INFLUENCE OF ENVIRONMENT ON BULB SOLIDITY

Aside from the usual varietal differences (*51*) in solidity, firmness or hardness of normally or well-matured bulbs is markedly affected by conditions during the period of maturity and curing. Conditions delaying maturity and curing also result in softer bulbs than conditions hastening maturity and curing. The addition of copper sulfate to a complete fertilizer on muck lands has increased the hardness of onion bulbs (*41*).

INFLUENCE OF ENVIRONMENT ON FLAVOR

With the development of a method for chemically determining the amount of volatile sulfur in onions (*60*), which is correlated with pungency, it has been demonstrated that the environment has a marked effect on onion flavor. Although the effects of the various components of the environment on pungency were not determined, it was found that onions from the same lot of seed grown at Davis, Calif., were more pungent than those grown at Winter Haven, Tex., near Washington, D. C., or at Amherst, Mass. Onions grown in north-central Ohio were also more pungent than from the three latter locations, but milder than those grown in California. Onions grown on sandy soil were less pungent than those grown on loam or muck soils (*61*). Volatile sulfur increased rapidly in the growing plant until the tops fell over after which it decreased with maturity and during storage. Varietal differences in pungency were associated with moisture content of the bulbs, i. e., the most pungent varieties had the lowest percentage of moisture (highest percentage of dry matter) (*34, 62*).

More recent work on pungency (*62a*) under controlled conditions shows that pungency increases with increase in average growing temperature, with a decrease in soil moisture, and during several months in storage. Onions grown on muck soil were more pungent than those grown on sand or loam and those grown on loam more pungent than those grown on sand.

INFLUENCE OF ENVIRONMENT ON STORAGE QUALITY

Loss of marketability (storage quality) is caused by rotting, sprouting, excessive root growth, and softening or shriveling accompanied by loss of the outer dry scales.

Rotting is usually the result of infection during the growth or curing of the bulbs, but infection may also follow unfavorable storage conditions. Infection and subsequent rotting may be largely prevented by rapid and complete drying of the neck and outer bulb scales and the maintenance of this dry condition at low temperatures in storage (*65, 70*). In the case of soil organisms that enter through the roots and root plate, pulling of the plants before the foliage has turned yellow may result in less rotting than allowing the plants to remain in the ground until the foliage is dry (*9, 55*).

Open and thick neck bulbs soon sprout (*5, 10*) and factors that prevent normal maturity (discussed above), therefore, influence the storage quality of the bulbs. Bulbs stored at high temperatures rot and sprout faster than at low temperatures (*6, 9, 10, 12, 31, 55, 68, 70, 79*). As onion bulbs do not freeze until they reach approximately 30° F., storage at 32° is recommended (*78*). Should they freeze, thawing should be done at about 40°, care being taken not to disturb or handle them while they are frozen (*47*).

Low humidity in the storage largely prevents the growth of roots and checks the spread of rots but increases the rate of softening and shriveling, whereas high humidity has the reverse effect.

DEVELOPMENTAL HISTORY OF SHAPE IN THE ONION

A study of shape development in flat, oblate, round, and oval types shows that they undergo the same series of general changes but reach these general shapes at different diameters. The seedlings or young plants of all varieties are nearly cylindrical in shape from the point of origin of roots to the first blade. As bulb formation proceeds, the shape of the lower part of this sheath region becomes progressively pyriform or torpedo, oval, round, oblate, or flat in most varieties. (See pls. 2, 4, 6, 8, 10, 12, 15, 17, 19, 20, 22, 24, 26, 28 for change in shape with change in size.) A variety that is classified as flat when 2½ to 3 inches in diameter may be especially desirable for dry sets because at one-half to three-fourths inch in diameter it forms round bulbs. A Sweet Spanish bulb at 2 inches in diameter is usually oval in shape, at 3 inches is approaching round, and at 4 inches or larger becomes oblate or slightly flattened. Shape is therefore controlled by both environmental and hereditary factors. A study of the diameter-to-depth relationship (and of the plates in this report showing random samples) shows that the greater the diameter, the flatter the shape, i. e., the larger the diameter-to-depth ratio becomes.

In addition to this diameter-depth relationship, which is only a rough index of shape, there are other developmental changes (of hereditary origin) that account for minor distinctions in shape. Two varieties may have the same diameter-depth index, but one will have a flat base whereas the other has a tapered or top-shaped base. As the number of cells in the sheaths or leaf bases that make up the bulk of the bulb does not increase after a very early development stage, the hereditary control must be in the rate of increase in size of cells and of intercellular spaces at different points along the vertical axis. In the case of a tapered-base bulb, the rate of growth in diameter probably increases gradually from the base to the point of greatest diameter, whereas in the flat-base bulb, the increase in growth rate is very marked at a point just above the base. This differential rate of growth at various points along the vertical axis may also take place at different bulb diameters or at different stages of development in the different varieties. The presence of a full complement of shape factors may therefore depend upon the attainment of a certain size for each variety.

DISTINGUISHING VARIETAL CHARACTERISTICS

The principal characteristics of the varieties of onions described in this publication are given in table 1.

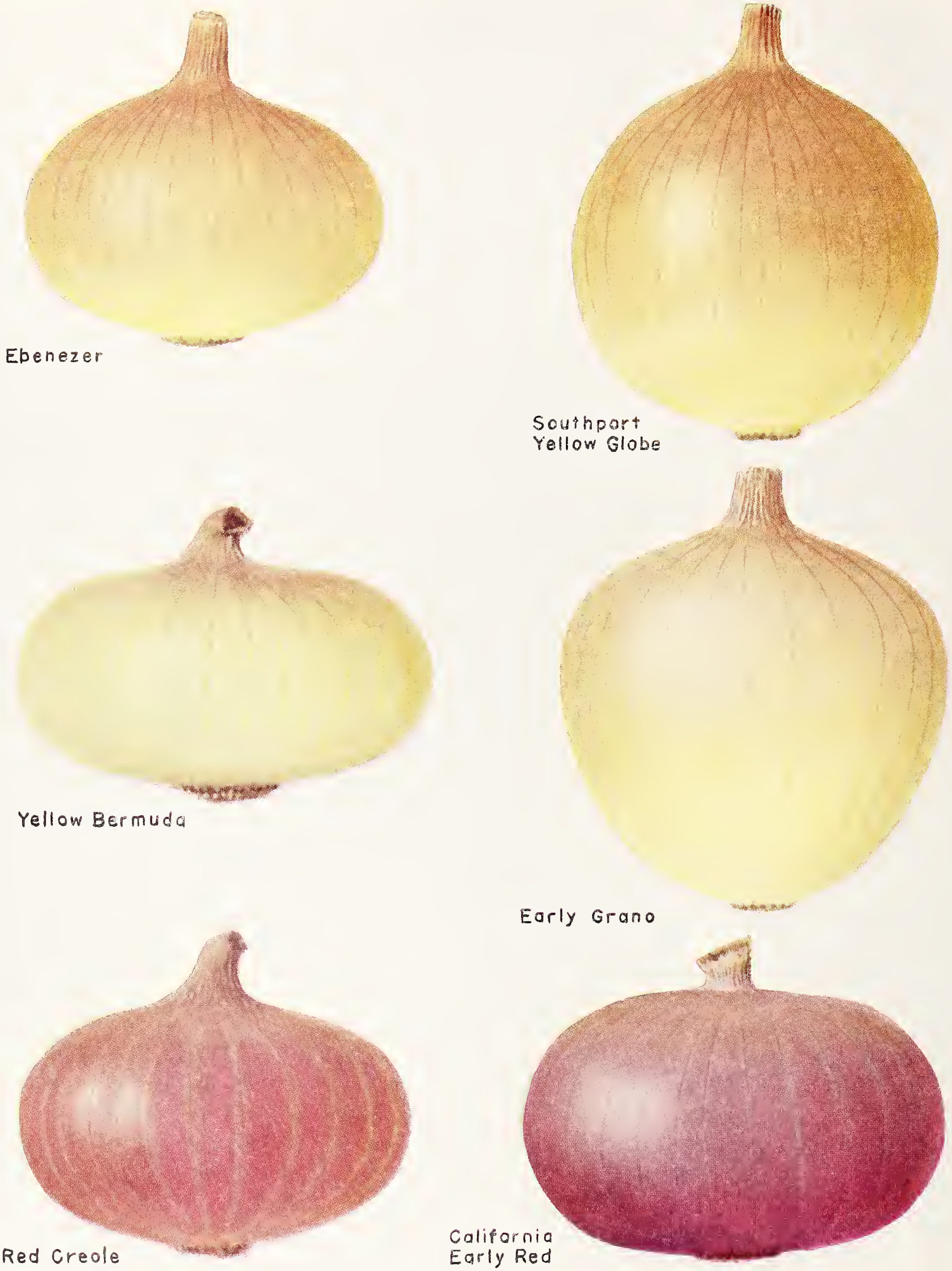
TABLE 1.—*Distinguishing characteristics of 21 varieties of onions*

Variety	Season of maturity	Leaf color	Plant height	Dry bulb scales			
				Color	Number	Thickness	Retention
Australian Brown	Midseason to late	Blue green	Short	Brown	Medium	Thick	Very good.
California Early Red	Second early	do	Medium	Purplish red	Very few	Medium	Fair to good.
Crystal Wax	Early	Medium green	Short	White	do	Thin	Poor.
Yellow Bermuda	do	do	do	Pale yellow	do	do	Do.
Early Grano	do	Light green	do	do	do	Thin to medium	Do.
Early Yellow Globe	Second early	Blue green	Medium	Medium yellow	Medium	Medium	Fair to good.
Ebenezer	do	do	Medium to tall	Pinkish yellow	do	do	Good.
Italian Red	Midseason to late	do	Medium	Purplish red	Very few	do	Poor.
Mountain Danvers	Second early	do	do	Brownish yellow	Medium	Medium to thick	Fair to good.
Ohio Yellow Globe	Midseason	do	do	do	do	do	Good.
Red Creole	Early	do	Very short	Buff red	do	Medium	Fair to good.
White Creole	do	do	do	White	do	do	Do.
Red Wethersfield	Midseason to late	do	Medium to tall	Purplish red	do	Medium to thick	Fair.
Southport Red Globe	do	do	do	do	Many	Medium	Good.
Southport White Globe	Midseason	do	do	White	do	Thin to medium	Do.
Southport Yellow Globe	Midseason to late	do	do	Medium yellow	do	Medium	Do.
Brigham Yellow Globe	do	do	do	Deep yellow	do	Medium to thick	Very good.
Sweet Spanish	Late	Light green	Tall	Brownish yellow	do	Medium	Good.
White Sweet Spanish	do	do	do	White	do	do	Do.
White Portugal	do	Blue green	Medium	do	do	do	Fair to good.
Yellow Globe Danvers	Midseason	do	do	Brownish yellow	do	do	Good.

Variety	Mature bulb				Flavor	Storage quality
	General shape	Shape of upper half	Shape of lower half	Solidity or firmness		
Australian Brown	Oblate	Round to tapered	Slightly rounded to round	Hard	Very strong	Very good.
California Early Red	Thick flat	Slightly rounded to slightly tapered.	Flat to slightly rounded	Soft	Very mild	Poor.
Crystal Wax	do	Flat to slightly rounded	Slightly depressed to flat	do	Mild	Do.
Yellow Bermuda	do	do	do	do	do	Do.
Early Grano	Ovate	Flat to round	Rounded to medium tapered	do	Very mild	Do.
Early Yellow Globe	Deep oblate	Slightly rounded to slightly tapered.	Slightly rounded to round	Medium	Strong	Fair.
Ebenezer	Oblate	do	Flat to slightly rounded	Medium to hard	Very strong	Good.
Italian Red	Torpedo	Medium to long tapered	Long oval to tapered	Soft	Very mild	Very poor.
Mountain Danvers	Deep oblate	Rounded to slightly tapered	Slightly rounded to round	Medium	Strong	Fair.
Ohio Yellow Globe	Obovate	Oval to tapered	Flat to slightly rounded	do	do	Good.
Red Creole	Thick flat to oblate	Slightly rounded to slightly tapered.	do	Hard	Very strong	Very good.
White Creole	do	do	do	do	do	Do.
Red Wethersfield	Thick flat	Flat to slightly rounded	do	Soft to medium	Strong	Fair.
Southport Red Globe	Round to oval	Round to oval to slightly tapered.	Round to oval	Medium to hard	do	Good.
Southport White Globe	Oblate to round	do	do	do	do	Do.
Southport Yellow Globe	Round to oval	do	do	do	do	Do.
Brigham Yellow Globe	do	do	do	do	do	Very good.
Sweet Spanish	Round	Round to slightly tapered	Round	Medium	Mild	Fair.
White Sweet Spanish	Deep oblate to round.	Slightly rounded to round	Slightly rounded to round	do	do	Fair to poor.
White Portugal	Oblate	Slightly rounded to slightly tapered.	Flat to slightly rounded	Medium to hard	Very strong	Good.
Yellow Globe Danvers	Deep oblate to round.	Round to slightly tapered	Slightly rounded to round	do	Strong	Do.

CLASSIFICATION OF PRINCIPAL VARIETIES OF ONIONS

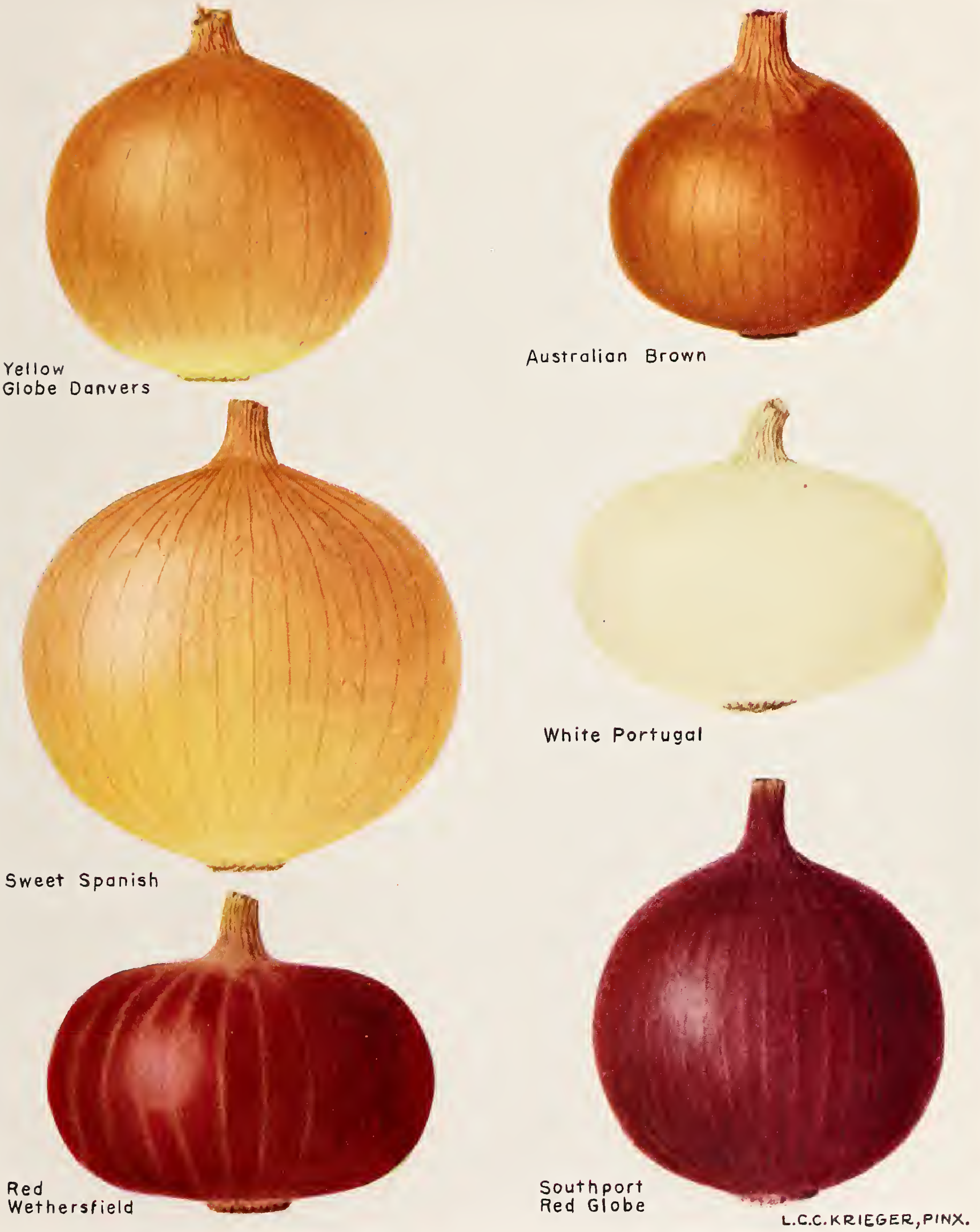
- 1a. Dry bulb scales yellow or brown.
  - 2a. Scales solid medium brown, oblate ---- AUSTRALIAN BROWN.
  - 2b. Scales yellow.
    - 3a. Thick flat to medium oblate.
      - Thick flat, light straw-yellow scales, mild flavor. YELLOW BERMUDA.
      - Medium oblate, pinkish-yellow scales, strong flavor. EBENEZER.
    - 3b. Not thick flat to medium oblate.
      - Deep oblate.
        - Scales light to medium yellow ---- EARLY YELLOW GLOBE.
        - Scales medium brownish-yellow --- MOUNTAIN DANVERS.
      - Not deep oblate.
        - Obovate (flattened base) --------- OHIO YELLOW GLOBE.
        - Not obovate.
          - Ovate (flattened upper half) ---------- EARLY GRANO.
          - Not ovate.
            - Round, medium brownish-yellow scales. YELLOW GLOBE DANVERS.
            - Oval.
              - Medium size.
                - Scales medium yellow and medium thick. SOUTHPORT YELLOW GLOBE.
                - Scales deep yellow and thick. BRIGHAM YELLOW GLOBE.
              - Large size, scales brownish yellow, flavor mild. SWEET SPANISH.
- 1b. Dry scales not yellow or brown.
  - 2a. Dry bulb scales white.
    - 3a. Flat, large diameter, mild flavor --- CRYSTAL WAX.
    - 3b. Not flat.
      - Thick flat to oblate.
        - Thick flat, early maturing ---- WHITE CREOLE.
        - Oblate, late maturing ------ WHITE PORTUGAL.
      - Deep oblate to round.
        - Medium size, strong flavor. SOUTHPORT WHITE GLOBE.
        - Large size, mild flavor. WHITE SWEET SPANISH.
  - 2b. Dry bulb scales red or purple.
    - 3a. Mild flavor, soft flesh.
      - Thick flat, large size ----- CALIFORNIA EARLY RED.
      - Torpedo or long oval -------------- ITALIAN RED.
    - 3b. Strong flavor, firm flesh.
      - Thick flat, large size --------- RED WETHERSFIELD.
      - Not thick flat.
        - Thick flat to oblate, buff red ---- RED CREOLE.
        - Round to oval, dark purplish red. SOUTHPORT RED GLOBE.



COLOR TYPES

Typical color of the outer intact dry scales of some of th

PLATE 1



Yellow Globe Danvers

Australian Brown

Sweet Spanish

White Portugal

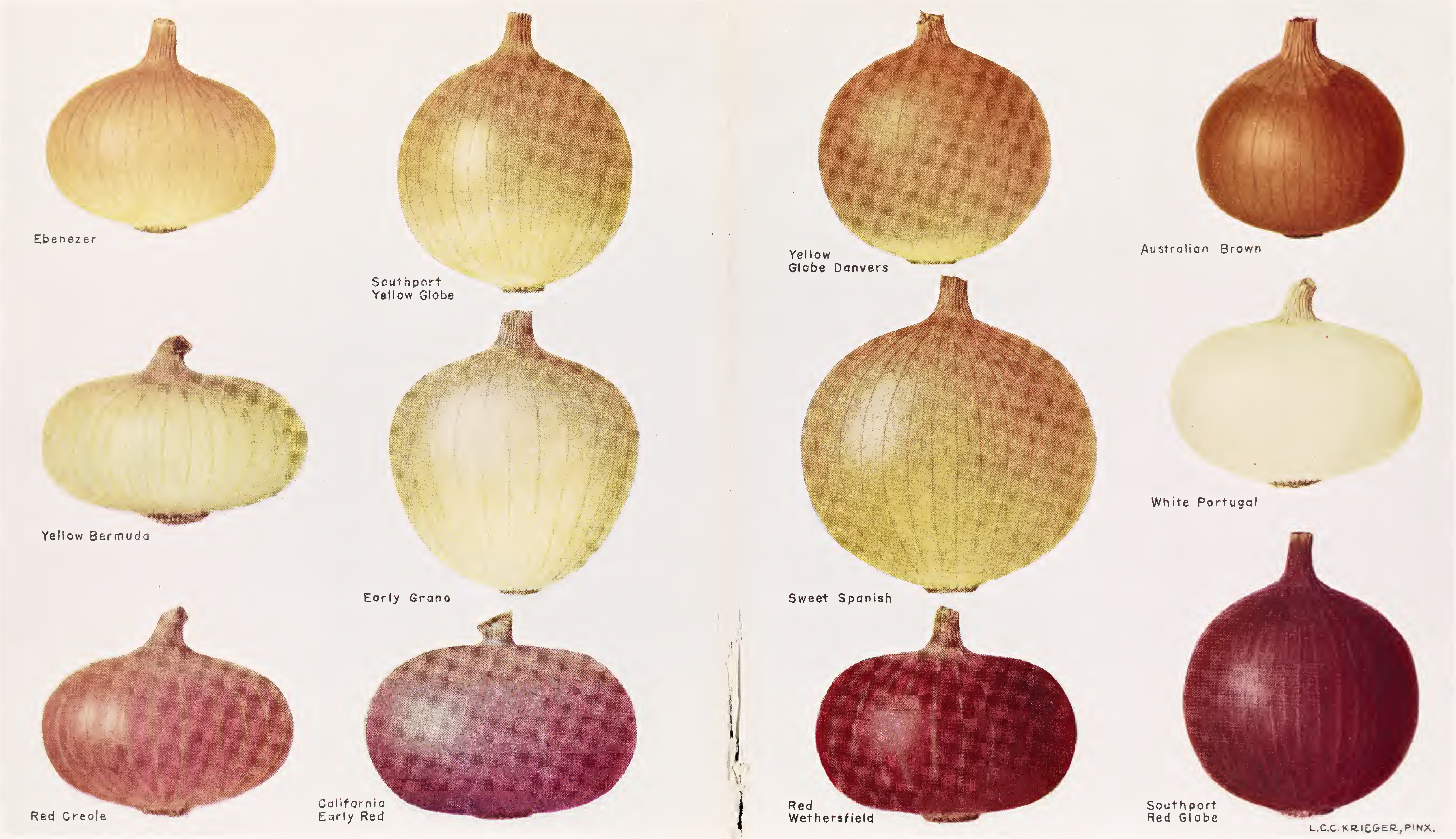
Red Wethersfield

Southport Red Globe

L.C.C. KRIEGER, PINX.

F ONIONS

rincipal American varieties of onions soon after curing.



COLOR TYPES OF ONIONS

Typical color of the outer intact dry scales of some of the principal American varieties of onions soon after curing.

AUSTRALIAN BROWN

BRIEF CHARACTERIZATION

Not as productive as other storage varieties in the northern onion-growing States. Limited in production to California and other west coast States, because of its excellent storage quality in farm storage in those States. Not adapted to the Southern States.

Midseason to late in maturity; the small- to medium-size, oblate-shaped bulbs have a medium number of thick, brown skins that are retained in good condition for a long time. The flesh is very firm or hard, light yellow in color, and very strong or pungent in flavor.

ADAPTABILITY AND USE

In the United States, Australian Brown is grown almost exclusively in California and on the west coast, where because of its ability to remain marketable for long periods under fairly warm and high humidity conditions during the winter in California it constitutes the major late-storage variety. It is also one of the longest keeping varieties in cold storage. May be grown successfully in any of the northern onion-growing sections, but the yields are usually lower than those of the Southport or other globe varieties. Sometimes used for the production of sets, which keep exceptionally well. Not adapted to the Southern States. The firm, pale-yellow flesh is very pungent and has a very high dry-matter content. The comparatively low yield, the difficulty of removing the heavy brown skins, and the yellow color of its flesh militate against its use for dehydration purposes.

SEASON

Midseason to late in maturity; when sown in December or January and set in the fields in late March in central California maturity takes place the last week in August; when seed is sown in greenhouses in December or January and plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., about July 25, at Farmington, Utah, about August 1, in north-central Ohio about August 10, and at Amherst, Mass., about August 20.

PLANT

Short; the longest leaves usually reaching an average height of 15 to 20 inches (38 to 51 cm.) at the maximum vegetative stage of development.

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length ranges from 6 to 10 [3] depending largely upon the length and kind of growing season; longest leaf on the plant is from 15 to 19½ inches (38 to 50 cm.) in average length in the Northern and Eastern States but may attain an average length of 24 inches (61 cm.) in California; average width is seven-sixteenths to ten-sixteenths of an inch (11 to 16 mm.) and average depth is 80 to 90 percent of the width. Mature leaves blue green, approximately 22 A 6 [4] to 23 A 6, but with the heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 1½ to 1⅞ inches (40 to 50 mm.) above the soil surface in the Northern and Eastern States and about 4¾ inches (120 mm.) in California and Texas; midlength diameter averages fifteen thirty-seconds to twenty thirty-seconds of an inch (12 to 16 mm.) in the Northern and Eastern States and twenty thirty-seconds to twenty-five thirty-seconds of an inch (16 to 20 mm.) in California and Texas. The outer succulent layer on young plants just below the leaves is very pale green (18 B 3) with darker green veins, but on older plants the veins of the basal portion become purplish brown (47 E 1) with yellowish orange (11 J 5) suffusion between them. As the outer layers age and dry they become deep buff or light brown (13 C 9).

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[3] In this and subsequent descriptions the range of averages is obtained from the crops grown in different years, locations, and seasons.

[4] References given in this and subsequent descriptions are to plate, column, and row; e. g., 22 A 6 refers to pl. 22, column A, and row 6, in A Dictionary of Color (*50*), and the name, when capitalized, that is given with the reference is the name assigned to that particular color.

MATURE CURED BULB

(Pls. 1, 2, and 3)

Medium size (diameter); majority of bulbs, 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 2.1 to 3.5 ounces (60 to 100 g.), diameter divided by depth ratio of 1.1 to 1.4, medium to deep oblate in general shape with round to tapered upper half to a medium-size but well-filled neck and the lower half slightly rounded to round.

The outer intact dry scales soon after curing are medium in number, thick; exceptionally well retained during handling and storage, dull buckskin brown (12 A 11) in color, which fades somewhat (12 B 9) around the neck and with age (pl. 1). The second and third dry scales are also highly colored on all bulbs.

Epidermis of outer fleshy scale, light yellow (10 H 1) with succeeding scales lighter yellow and the center almost white. Flesh with epidermis removed is near white (10 A 1), but in cross section with epidermis in place the flesh is pale yellow (10 F 1) shading to near white in the center, very firm, very strong, and high in percentage of dry matter.

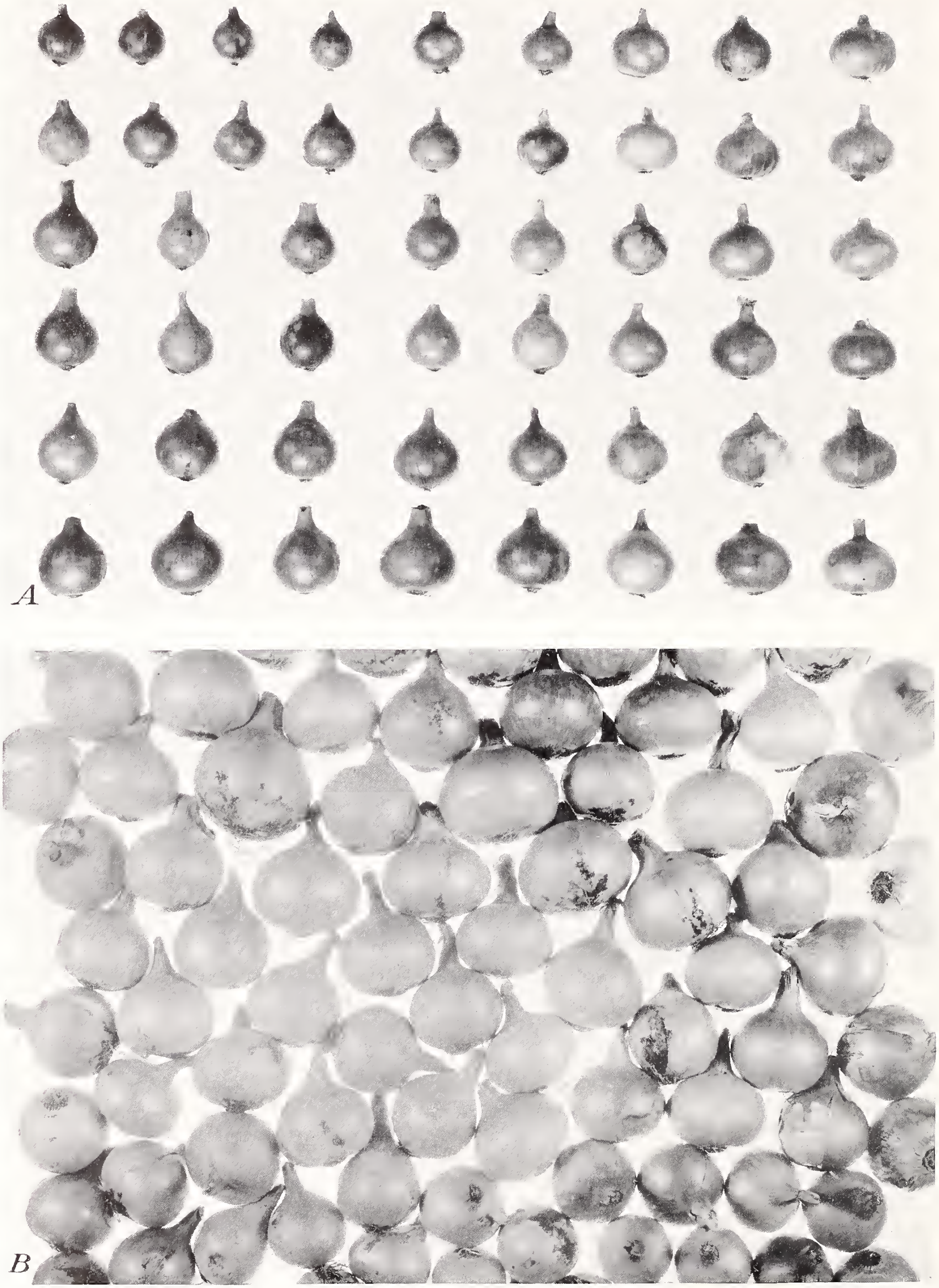
SYNONYMS

Australian Brown Globe, Brown Australian, Brown Spanish, Brown 5, Giant Australian Brown, Red Australian Brown.

HISTORY

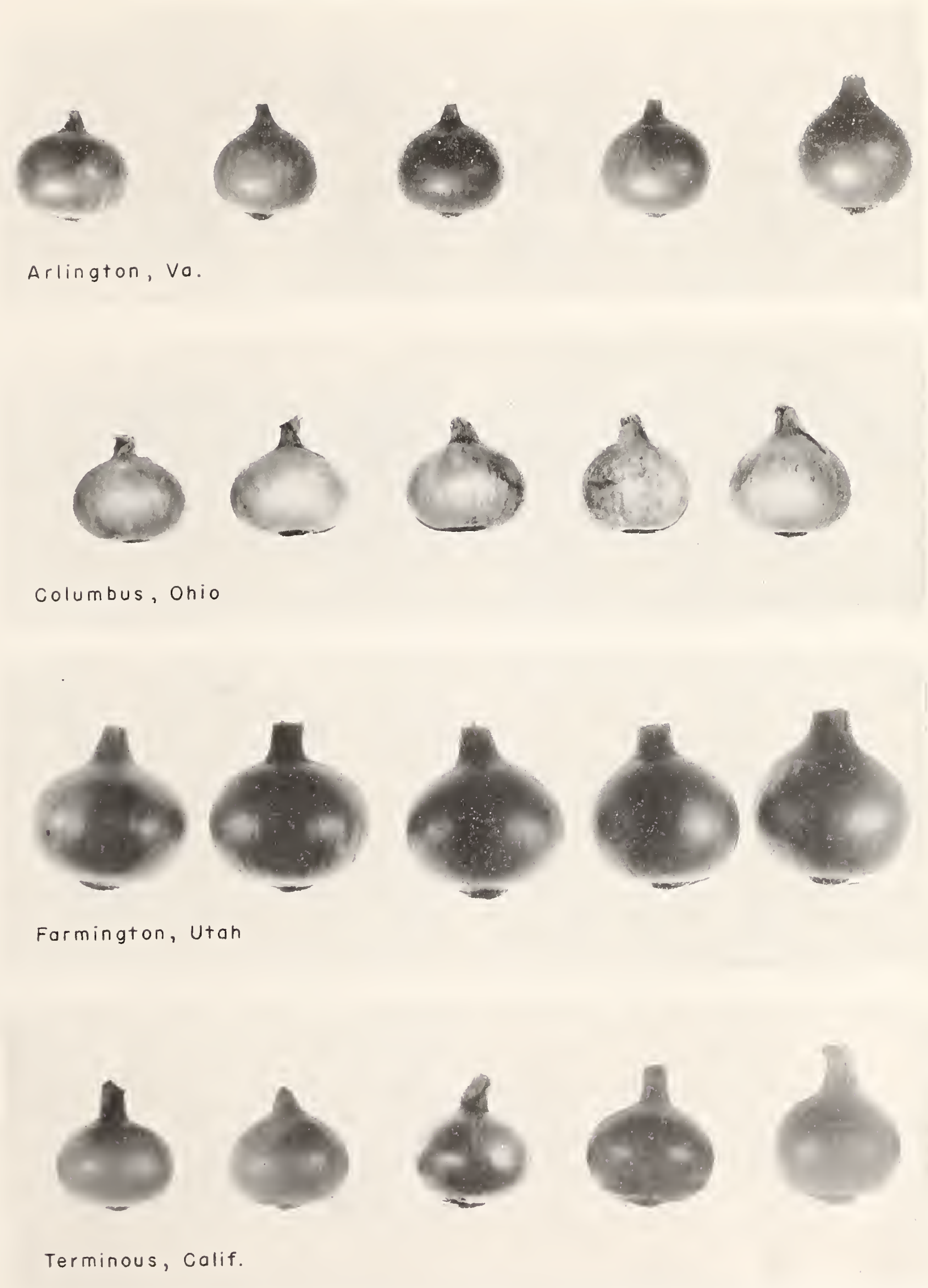
The name Australian Brown first appears in the 1897 catalog of W. Atlee Burpee & Co. and was a new name for the product of Brown Spanish seed originally imported from Australia by C. C. Morse & Co., who grew the seed crop for Mr. Burpee. Subsequent improvements on the original stock have been made by a number of seedsmen since its introduction. The California Agricultural Experiment Station released an improved stock of this variety in 1932, and the above type description is based on this stock.

AUSTRALIAN BROWN ONION



Random samples of a very uniform stock of Australian Brown onion grown (A) at Arlington, Va. (X 1/5), and (B) at Terminus, Calif. (X 1/3), showing the variation in shape with size.

AUSTRALIAN BROWN ONION



An acceptable range in type of large and very large bulbs of Australian Brown onion as grown in the different locations and seasons. The third bulb from the left in the Virginia and California ranges is most nearly ideal in shape. X 1/3.

CALIFORNIA EARLY RED

BRIEF CHARACTERIZATION

A market gardener's variety from central California but may be grown in other northern onion-growing sections. Not adapted to the Southern States or for storage.

Second early in maturity; the medium- to large-size, thick flat bulbs have very few, medium-thick, purplish-red dry skins that soon loosen and are broken off in handling. The flesh is soft and easily bruised and very mild and sweet in flavor.

ADAPTABILITY AND USE

California Early Red is primarily grown as an early intermediate crop in the interior valleys of central California for immediate local consumption, as it bruises easily and subsequently discolors badly in shipment and has a very short storage life. One of the nonbolting varieties when grown for the intermediate crop in California. If seedlings are planted early in the spring the variety makes very good yields of mild-flavored bulbs in the Northern and Eastern States. It is not adapted to the Southern States because of the length of day required for bulb formation. Highly esteemed for salad and garnish purposes, because of its large size, attractive color, and mild-flavored flesh.

SEASON

Second early to midseason in maturity; when sown in September and transplanted into the fields in December or January in southern Texas and central California the bulbs usually mature in May or June in Texas and during June in central California; when seed is sown in the greenhouse during December and January and the plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., during the first third of July, at Farmington, Utah, and north-central Ohio during the last third of July, and at Amhert, Mass., about the middle of August.

PLANT

Medium height; the longest leaves usually reaching an average height of 18 to 22 inches (46 to 56 cm.) at the maximum vegetative stage of development in the Northern States and Texas and 30 to 36 inches (76 to 92 cm.) when grown as an intermediate crop in California.

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 6 to 12, depending largely upon the length and kind of growing season; longest leaf is from 15 to 18½ inches (38 to 47 cm.) in average length in the Northern and Eastern States, but may attain an average length of 25 inches in California when sown in the fall; average width is eleven thirty-seconds to sixteen thirty-seconds of an inch (9 to 13 mm.) in the Northern and Eastern States and nineteen thirty-seconds of an inch (15 mm.) in California, and average depth is 65 to 85 percent of the width. Mature leaves blue green, approximately 22 A 6 to 23 A 6, but with the heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 7⅞ to 2¾ inches (50 to 70 mm.) above the soil surface in the Northern and Eastern States and 5 to 6 inches (130 to 150 mm.) in California and Texas; midheight diameter averages thirteen thirty-seconds to nineteen thirty-seconds of an inch (10 to 15 mm.) in the Northern and Eastern States and twenty thirty-seconds to twenty-seven thirty-seconds of an inch (16 to 22 mm.) in California and Texas. The outer succulent layer on young plants is very pale green (18 B 3) with darker green veins just below the leaves, but on older plants the basal portion soon becomes uniformly suffused with pinkish purple ranging from 43 G 3 to 45 G 3, as the base of the plant is approached and as it matures. As the outer layers age and become dry the purple color between the veins fades to a purplish buff.

MATURE CURED BULB

(Pls. 1, 4, and 5)

Large in diameter in the Northeastern States, majority of bulbs 2.5 to 3.0 inches in diameter (6.3 to 7.6 cm.), weight of 3.2 to 5.3 ounces (90 to 150 g.), and a diameter divided by depth ratio of 1.3 to 1.7. In Texas and the Western States, under irrigation it attains very large size, majority of bulbs 3.0 to 3.5 inches in diameter (7.6 to 8.9 cm.), weight of 5.3 to 8.0 ounces (150 to 225 g.), diameter divided by depth ratio of 1.5 to 1.8. Thick flat to medium oblate in general shape with the upper half slightly rounded to slightly tapered on the smaller bulbs but flat to slightly rounded on the larger bulbs, neck small and well filled, lower half flat to slightly rounded in shape.

The outer intact dry scales soon after curing are very few in number, medium in thickness, fairly well retained during handling, shiny medium reddish purple (4 H 5) at midlength with brighter purple (5 A 6) at base and more buff (near 4 G 9) toward neck (pl. 1). The dry scales become dull and more buff in color with age.

Epidermis of outer fleshy scale light reddish purple (51 F 7) with succeeding scales lighter in color toward the center, which is very pale purplish pink (50 A 2). Flesh with epidermis removed is near white (50 A 1), but in cross section with epidermis in place the flesh is pale purplish pink (51 D 2 to 50 A 2), fading somewhat toward center of bulbs, soft, very mild in flavor, and low to medium in percentage of dry matter.

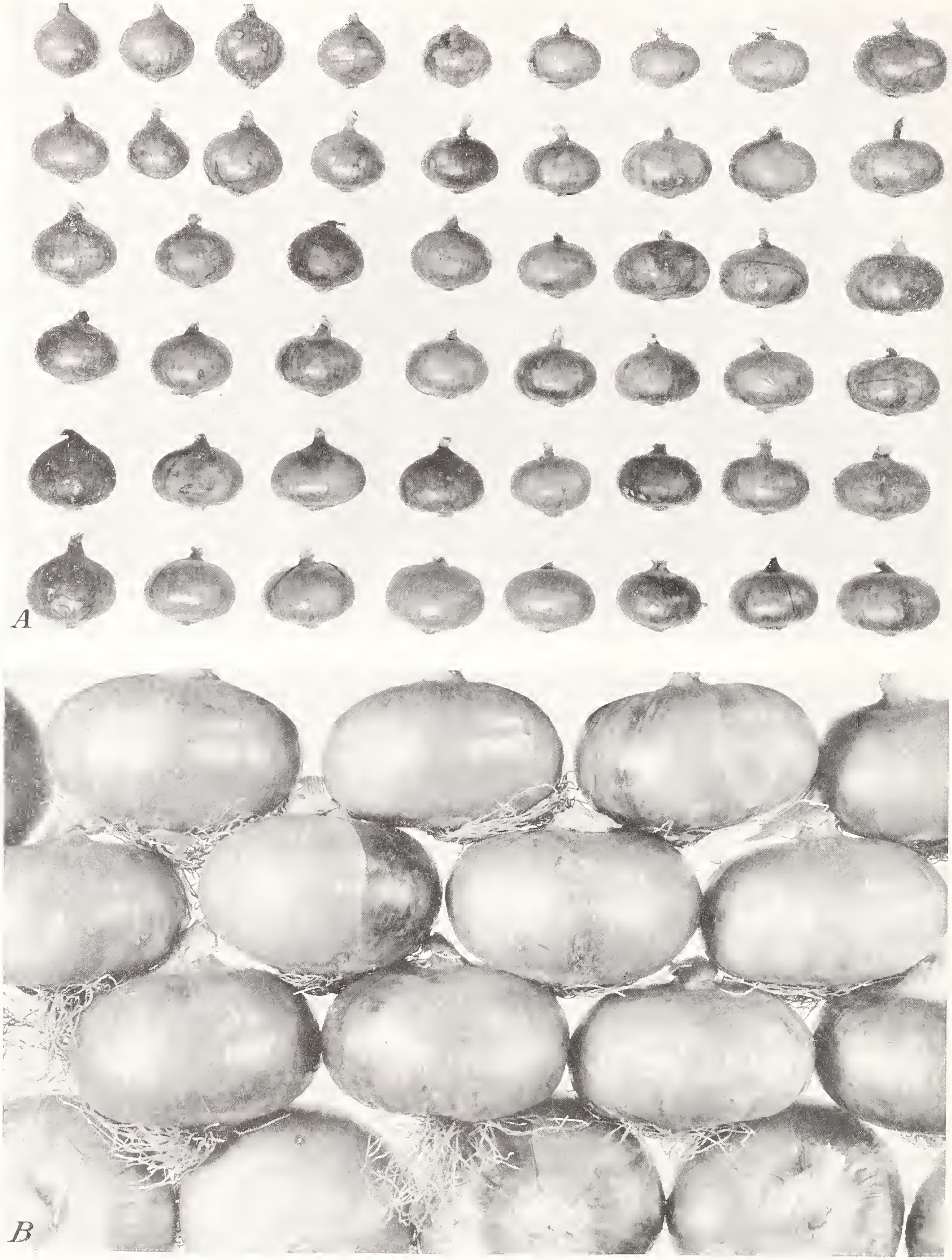
SYNONYM

Red 21.

HISTORY

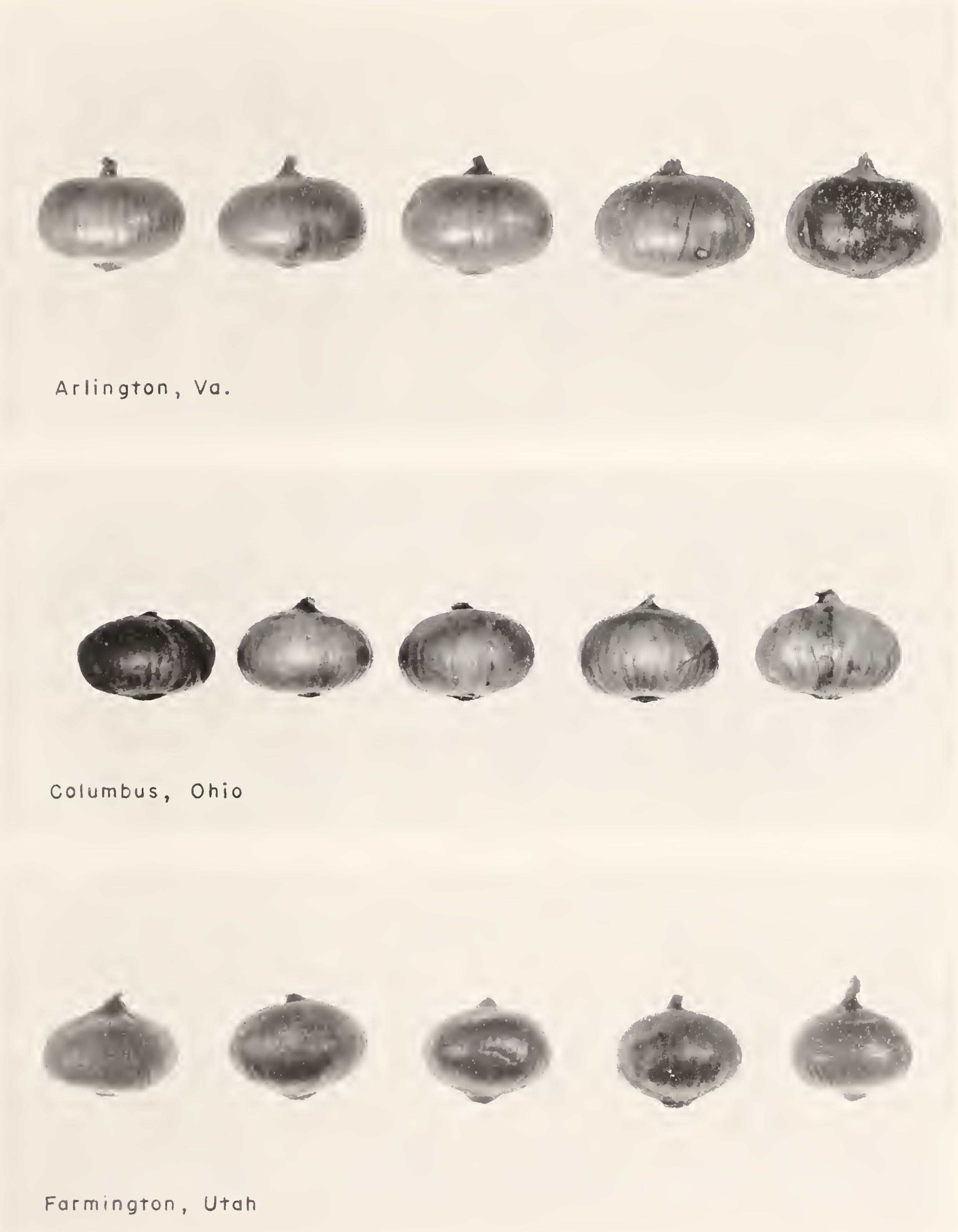
Selected by gardeners and seedsmen in the vicinity of San Francisco from the variety Red Italian Tripoli and probably first listed in the 1890 catalog of W. Atlee Burpee & Co. The type description is based on a stock released to the public September 1, 1935, as California Early Red U. C. No. 1 by the Division of Truck Crops, University of California, Davis, Calif. (*63*).

CALIFORNIA EARLY RED ONION



Random samples of a very uniform strain of California Early Red onion grown (A) at Arlington, Va. (X 1/5), and (B) at Davis, Calif. (X 1/2), showing a narrow range in shape with size.

CALIFORNIA EARLY RED ONION



An acceptable range in type of California Early Red onion grown in different locations and seasons. X 1/3. *The third bulb from the left in the Virginia range is most nearly ideal in shape.*

CRYSTAL WAX

BRIEF CHARACTERIZATION

Adapted to the Southern States, where it may be grown through the winter. Not adapted to the Northern States when grown from seed, but when green plants are set early in the spring, fair crops may be obtained. Soon rots or sprouts in storage.

Early in maturity; the medium- to large-size, flat bulbs have very few, thin, shiny, white dry skins that are soon broken and lost in handling. The flesh is soft and very mild in flavor.

ADAPTABILITY AND USE

The Crystal Wax variety is adapted to the same regions and for the same uses as Yellow Bermuda. Because of the white color, it is more difficult to produce bulbs clean and bright enough to obtain the market premium usually offered for such onions.

SEASON

Early maturing; when sown in early September and transplanted into the fields in November and December in southern Texas and California the bulbs usually mature in April or May and in the northern sections of both States at a still later date; when seed is sown in the greenhouse during December and January in the Northern States and plants set in the fields as soon as possible, maturity is reached in the vicinity of Washington, D. C., during the latter part of June, at Farmington, Utah, during the early part of July, in north-central Ohio during the latter half of July, and at Amherst, Mass., during early August. Plants set in the field at the same time seed is sown mature only a few days later at these northern locations.

PLANT

Short; the longest leaves usually reaching an average height of 13 to 17 inches (33 to 43 cm.) with individuals as short as 11 inches (28 cm.) and as tall as 20 inches (51 cm.) at the maximum vegetative stage of development.

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 6 to 11 depending largely upon the length and kind of growing season; longest leaf is from 11 to 14 inches (28 to 36 cm.) in average length in the Northern and Eastern States, but may attain an average length of 19½ inches (50 cm.) in Texas and California when planted in the fall; average width is five-sixteenths to seven-sixteenths of an inch (8 to 11 mm.) in the Northern and Eastern States but seven-sixteenths to eight-sixteenths of an inch (11 to 13 mm.) in Texas and California with average depth of 70 to 90 percent of the width. Mature leaves medium green, approximately 22 E 7 to 23 E 6, but with the medium to heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Same size as Yellow Bermuda but lacks the pale-yellow color. The dry outer layers are almost white with light pinkish-brown veins near the top.

MATURE CURED BULB

(Pls. 6 and 7)

Small to medium in diameter in the Northeastern States, majority of bulbs 1.5 to 2.5 inches (3.8 to 6.3 cm.), weight of 0.9 to 2.6 ounces (25 to 75 g.), diameter divided by depth ratio of 1.2 to 2.0. In Texas and the Western States under irrigation it attains large diameter, majority of bulbs 3.0 to 3.5 inches in diameter (7.6 to 8.9 cm.), weight of 4.9 to 7.1 ounces (140 to 200 g.), diameter divided by depth ratio of 1.5 to 2.1. Smaller bulbs medium oblate to thick flat in general shape whereas larger bulbs are thick flat to flat. Upper half usually flat or occasionally slightly depressed or slightly rounded, whereas lower half is usually flat or occasionally slightly depressed or slightly rounded.

The outer intact dry scales soon after curing are very few in number, thin to medium in thickness, soon broken and lost in handling, shiny near white (18 A 1) in color with slight buff color in veins near neck. It becomes dull with age.

Epidermis of outer fleshy scales near white (between 18 A 1 and 18 B 1) except when exposed to strong light during curing when it is slightly greened. Flesh with epidermis removed is near white (18 A 1) in color, but in cross section with epidermis in place the flesh is slightly cream (between 18 A 1 and 18 B 1) shading to near white (18 A 1) at the center, soft, mild in flavor, and low to medium in percentage of dry matter.

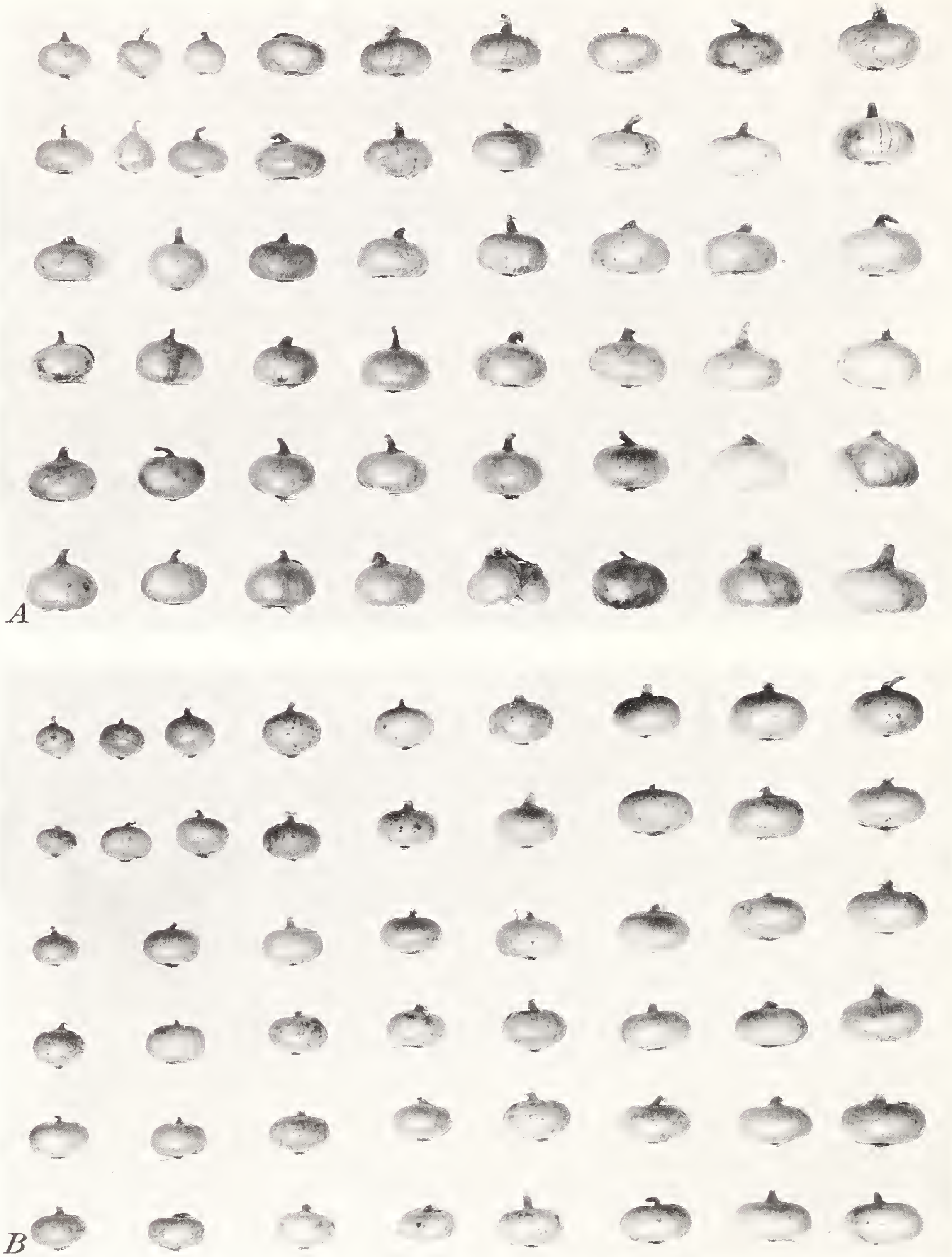
SYNONYMS

Bermuda White, Crystal Wax Bermuda, Crystal Wax Quality, Crystal Wax Teneriffe, Crystal White, Crystal White Wax, Crystal White Wax Bermuda, Large Early White Bermuda, Wax Bermuda, White Bermuda, and White Bermuda Crystal Wax.

HISTORY

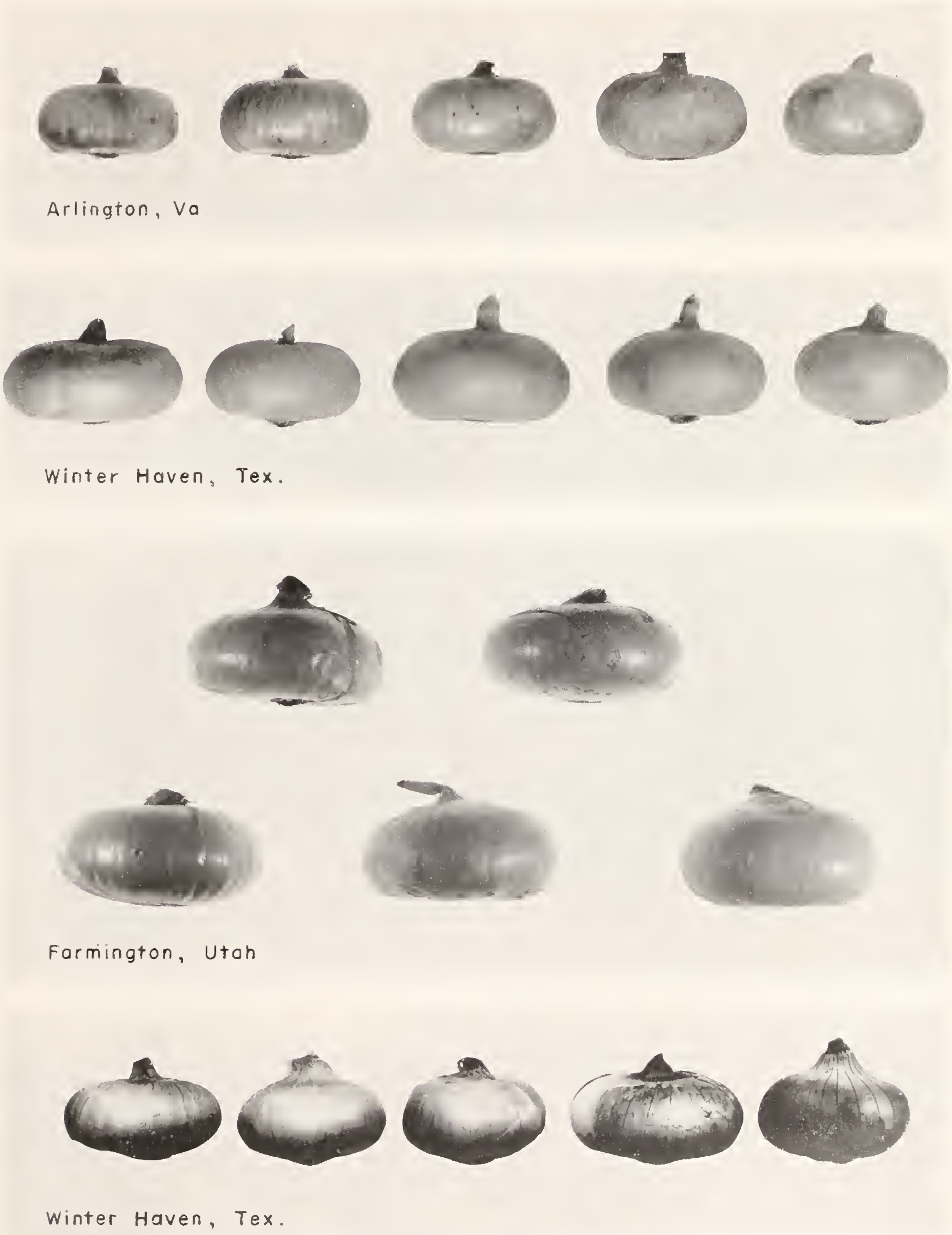
Crystal Wax was first listed by H. G. Hastings in the fall of 1897 with a sufficiently clear description to distinguish it from White Bermuda, which had light-yellow skins and later became known more correctly as Yellow Bermuda.

YELLOW BERMUDA ONION



Random samples of the same stock of Yellow Bermuda onion showing the difference in size and shape when grown in a favorable year (A) as compared with an unfavorable year (B) at Arlington, Va. X 1/5.

YELLOW BERMUDA ONION



An acceptable range in type of the same stock of Yellow Bermuda onion grown in different locations and seasons. X 1/3. The third bulb from the left in the Virginia range is most nearly ideal in shape.

YELLOW BERMUDA

BRIEF CHARACTERIZATION

The most extensively grown variety in Texas and may be grown in other Southern States, where the plants may grow through the winter. When grown from seed it is not adapted to northern onion-growing sections, but when grown from green plants set early in the spring, fair-size bulbs may be produced. It is a poor storage variety.

Early in maturity; the medium- to large- size, flat bulbs have very few, thin, shiny, pale-yellow skins that are soon broken and lost in handling. The flesh is soft and very mild in flavor.

ADAPTABILITY AND USE

Yellow Bermuda is adapted for culture in the Southern States, where the plants may grow throughout the winter. The most important variety grown in all sections of Texas and Coachella Valley and upper San Joaquin Valley sections of California, where it is grown in extensive acreages for the early market. It is not advisable to plant the seed in the field in the Northern States, as the early date at which bulbing takes place results in small bulbs. Fair-size bulbs may be produced by setting green plants early in the spring provided high temperatures do not occur too soon after planting. When grown on muck or peat lands the bulbs split and double both at the top and across the root plate. Bolts badly when exposed to low temperatures for any considerable length of time and is therefore little used for the intermediate crop of central California. Esteemed for salad and cooking because of the mild flavor, but has a very short storage life.

SEASON

Early maturing; when sown early in September and transplanted into the fields in November and December in southern Texas and California the bulbs usually mature in April or May and in the northern sections of both States at a still later date; when seed is sown in the greenhouse during December and January in the Northern States and plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., during the latter part of June, at Farmington, Utah, during the early part of July, in north-central Ohio during the latter half of July, and at Amherst, Mass., during early August. Plants set in the field at the same time seed is sown mature only a few days earlier at these northern locations.

PLANT

Short; the longest leaves usually reaching an average height of 13 to 17 inches (33 to 43 cm.) with individuals as short as 11 inches (28 cm.) and as tall as 20 inches (51 cm.) at the maximum vegetative stage of development.

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 6 to 11 depending largely upon the length and kind of growing season; longest leaf is from 11 to 14 inches (28 to 36 cm.) in average length in the Northern and Eastern States but may attain an average length of 19½ inches (50 cm.) in Texas and California when planted in the fall; average width is five-sixteenths to seven-sixteenths of an inch (8 to 11 mm.) in the Northern and Eastern States, but seven-sixteenths to eight-sixteenths of an inch (11 to 13 mm.) in Texas and California with average depth of 70 to 90 percent of the width. Mature leaves medium green, approximately 22 E 7 to 23 E 6, but with the medium to heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 1½ to 2⅜ inches (40 to 60 mm.) above the soil surface in the Northern and Eastern States and 4¾ inches (120 mm.) in California and Texas; midheight diameter averages ten thirty-seconds to fifteen thirty-seconds of an inch (8 to 12 mm.) in the Northern and Eastern States and twenty-two thirty-seconds of an inch (18 mm.) in California and Texas. The outer succulent layer just below the leaves on young plants is very light green (18 D 3) with slightly darker green veins, but on older plants the veins become yellowish brown with a light, yellow suffusion between them. As the outer layers age and dry they become pale buff in color.

MATURE CURED BULB

(Pls. 1, 6, and 7)

Small to medium in diameter in the Northeastern States, majority of bulbs 1.5 to 2.5 inches (3.8 to 6.3 cm.), weight of 0.9 to 2.6 ounces (25 to 75 g.), diameter divided by depth ratio of 1.2 to 2.0. In Texas and the Western States under irrigation it attains large diameter, majority of bulbs 3.0 to 3.5 inches in diameter (7.6 to 8.9 cm.), weight of 4.9 to 7.1 ounces (140 to 200 g.), diameter divided by depth ratio of 1.5 to 2.1. Smaller bulbs medium oblate to thick flat in general shape whereas larger bulbs are thick flat to flat. Upper half usually flat or occasionally slightly depressed or slightly rounded, whereas lower half is usually flat or occasionally slightly depressed or slightly rounded.

The outer intact dry scales soon after curing are very few in number, thin to medium in thickness, soon broken and lost in handling, shiny pale straw yellow (10 C 1) at the base and at midlength with more orange and brown toward the neck (11 C 6) (pl. 1). When shipped without curing, as is commonly the case in Texas, the color of the partially dried outer scale is pale yellowish green (near 11 C 1). The dry scales become duller and deeper color with age.

Epidermis of outer fleshy scales pale yellow (10 B 1) in color with succeeding scales still lighter yellow and the center near white (10 A 1). Flesh with epidermis removed is near white (10 A 1) in color, but in cross section with epidermis in place the flesh is very pale yellow (10 B 1) shading to near white in the center, soft, mild in flavor, and low in percentage of dry matter.

SYNONYM

White Bermuda.

HISTORY

The Early Bermuda or Teneriffe onion first appeared in the catalogs of several American seedsmen in 1883 and from the meager descriptions was what is now called Red Bermuda. The type with pale-yellow skins was first listed by Peter Henderson & Co. in 1888 as White Bermuda. D. Landreths & Co. for 1890 says that although shipped as White Bermuda it really "has quite a yellowish character" and, although known as a product of Bermuda, is of Italian origin.

EARLY GRANO

BRIEF CHARACTERIZATION

A recently introduced variety that is adapted for culture in the Southern States where it may be grown through the winter and in the Northern States where green plants are set early in the spring. It does not keep well in storage. Somewhat resistant to damage from thrips.

Early in maturity; the medium- to large-size, round to top-shaped bulbs have very few, thin to medium-thick, pale-yellow skins that are soon broken and lost in handling. The flesh is soft and very mild in flavor.

ADAPTABILITY AND USE

Early Grano is a relatively new variety in America, adapted to the same regions and uses and as early maturing as Yellow Bermuda and because of its higher yields should supplant that variety as it becomes better known by the trade and consumer. It has shown some promise as a very early variety in a number of Canadian Provinces and in some of the higher altitudes of the Rocky Mountain States. It is also rapidly increasing in importance in Texas, especially under its synonym Early Yellow Babosa. Somewhat resistant to damage by thrips, and bolts rather badly when grown as an intermediate crop in central California.

SEASON

Early maturing; when sown in early September and transplanted into the fields in November and December in southern Texas and California the bulbs usually mature in April or May and in the northern sections of both States at a later date; when seed is sown in the greenhouse during December and January in the Northern States and plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., during the latter part of June, at Farmington, Utah, during the early part of July, in north-central Ohio during the latter half of July, and at Amherst, Mass., during early August, or about the same time as or a few days later than Yellow Bermuda.

PLANT

Short; the longest leaves usually reaching an average height of 15 to 19 inches (38 to 48 cm.) at the maximum vegetative stage of development in the Northern States and Texas and even taller when grown as an intermediate crop in California.

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 5 to 11 depending largely upon the length and kind of growing season; longest leaf is from 14 to 16½ inches (36 to 42 cm.) in average length in the Northern and Eastern States, but may attain an average length of 24 inches (61 cm.) in Texas and California when planted in the fall; average width is eleven thirty-seconds to sixteen thirty-seconds of an inch (9 to 13 mm.) in the Northern and Eastern States, but one-half to three-fourths of an inch (13 to 19 mm.) in Texas and California when grown in the winter, with an average depth of 65 to 85 percent of the width. Mature leaves light green, approximately 22 K 7, but with the slight bloom rubbed off the color is lighter green, approximately 21 K 7, with young or rapidly growing leaves about the same color.

SHEATH COLUMN

Oldest succulent leaf is from 1½ to 2⅜ inches (40 to 60 mm.) above the soil surface in the Northern and Eastern States and 4¾ inches (120 mm.) in California and Texas; midheight diameter averages five-sixteenths to seven-sixteenths of an inch (8 to 11 mm.) in the Northern and Eastern States and thirteen-sixteenths of an inch (21 mm.) in California and Texas. The outer succulent layer just below the leaves on young plants is very pale green (17 B 3) with slightly darker-green veins, but on older plants the veins become yellowish brown with a light-yellow suffusion between them. As the outer layers age and dry they become pale pinkish in color.

MATURE CURED BULB

(Pls. 1, 8, and 9)

Medium size in the Northeastern States where the majority of bulbs usually are 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 2.1 to 3.5 ounces (60 to 100 g.), and a diameter divided by depth ratio of 0.9 to 1.4. In Texas and the Western States under irrigation it reaches large size, the majority of bulbs usually between 2.5 and 3.0 inches diameter (6.3 to 7.6 cm.) with a weight of 3.5 to 5.6 ounces (100 to 160 g.) and may reach 3.5 to 4.0 inches in diameter (8.9 to 10.2 cm.) with a diameter divided by depth ratio of 0.95 to 1.5. General shape varies from oblate to short top-shape, top-shape (ovate), and oval; upper half flat to rounded to a small neck that is occasionally slightly sunken or open but usually flat or slightly raised and well filled; lower half usually tapered (short to long taper) in irrigated sections, but more rounded in the nonirrigated Northeastern States.

The outer intact dry scales soon after curing are very few in number, thin to medium in thickness, and soon broken and lost in handling, shiny pale straw yellow (9 D 3) at midlength with lighter yellow (9 E 2) at base and slightly darker (11 B 7) toward the neck (pl. 1). The dry scales become dull and faded with age.

Epidermis of outer fleshy scale light yellow (9 C 1), with succeeding scales lighter yellow and the center almost white. Flesh with epidermis removed is near white (10 A 1) in color, but in cross section with epidermis in place the flesh is very pale yellow (9 B 1) shading to near white in the center, soft, mild in flavor, and very low in percentage of dry matter.

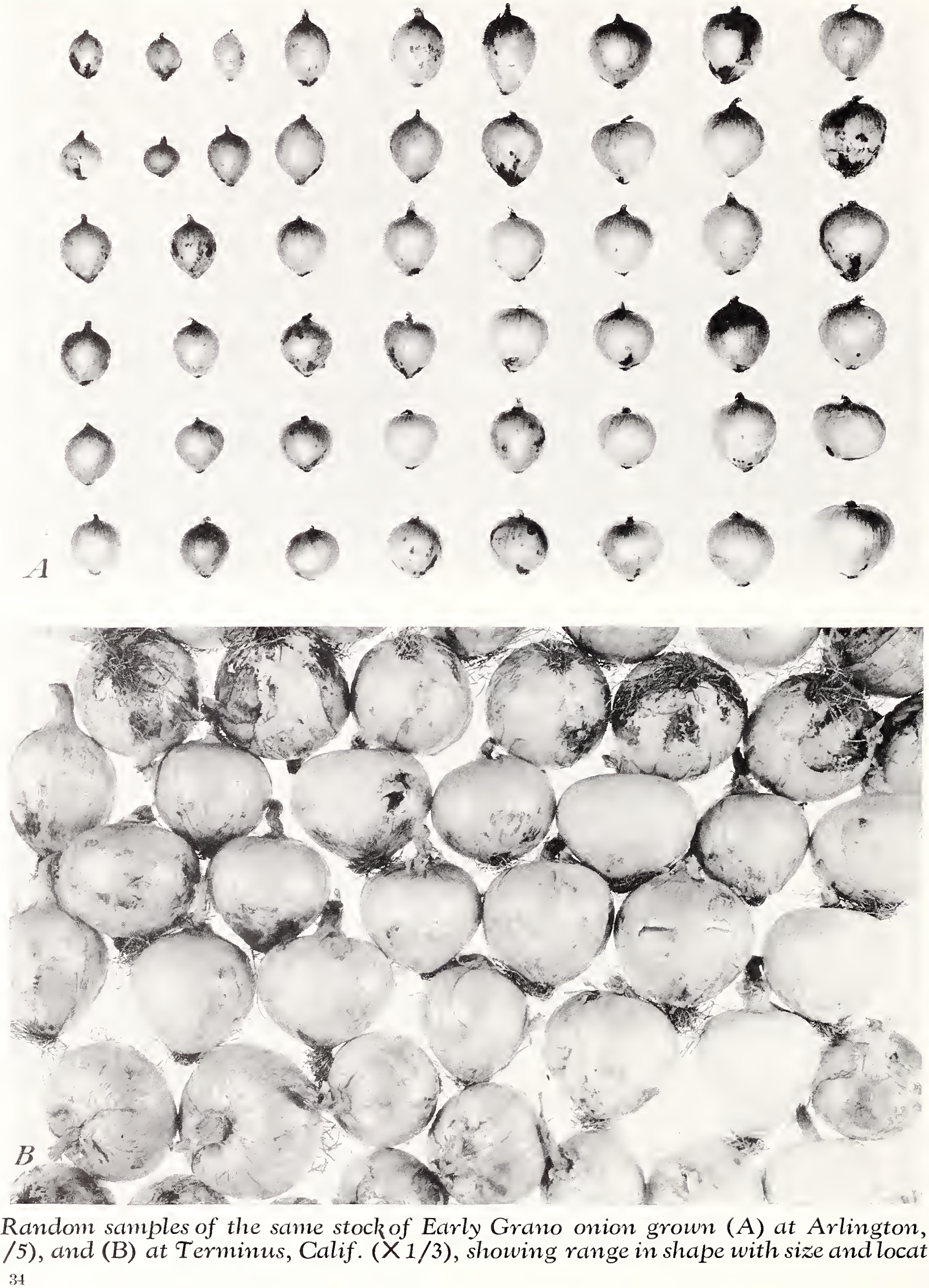
SYNONYMS

Babosa, Earliest Express, Early Sweet Spanish, Early Yellow Babosa, and Express Globe.

HISTORY

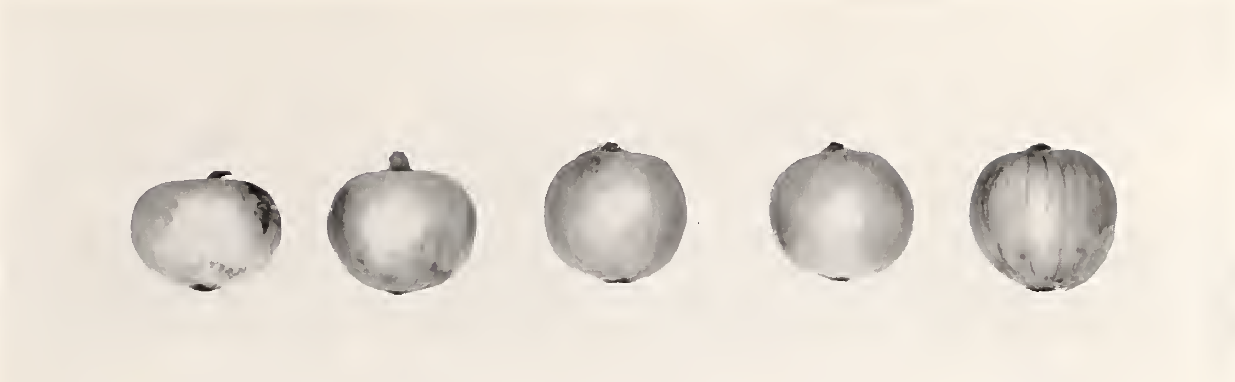
The original seed of this variety was imported from Valencia, Spain, in 1925 by the Barteldes Seed Co. under the name and number, Valencia Grano 9452, and again in 1926. The New Mexico Agricultural Experiment Station grew seed from the original lot of bulbs, has made selections to improve the shape in subsequent generations, and in 1931 in Bulletin 193 of that station proposed the name Early Grano.

EARLY GRANO ONION

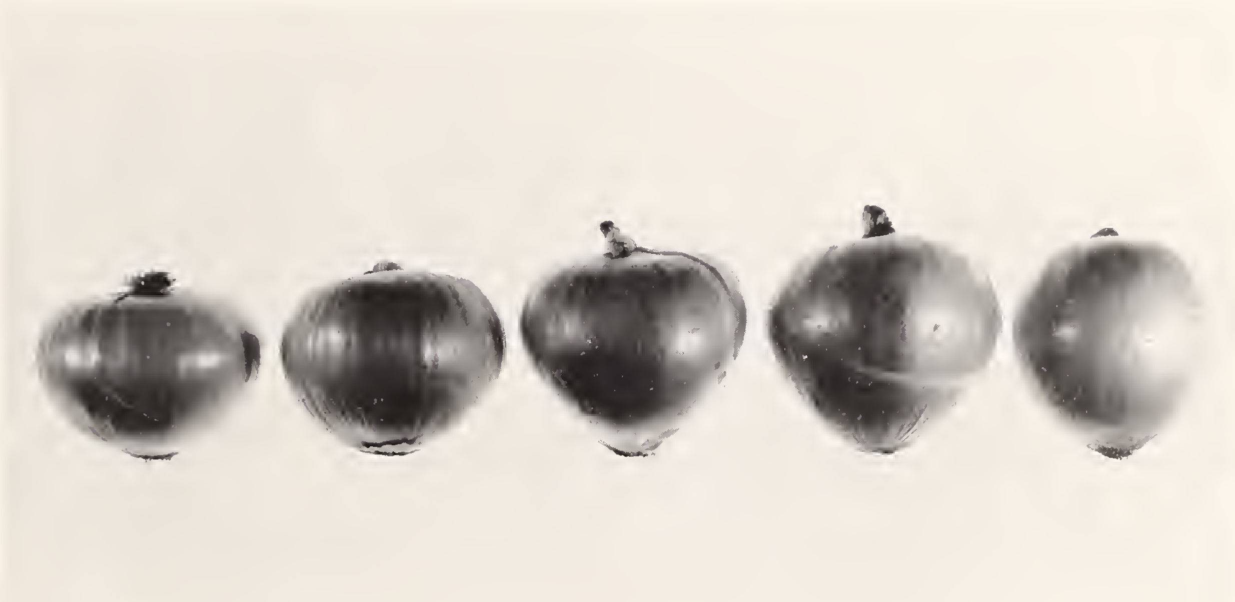


Random samples of the same stock of Early Grano onion grown (A) *at Arlington, Va.* (X 1/5), *and* (B) *at Terminus, Calif.* (X 1/3), *showing range in shape with size and location.*

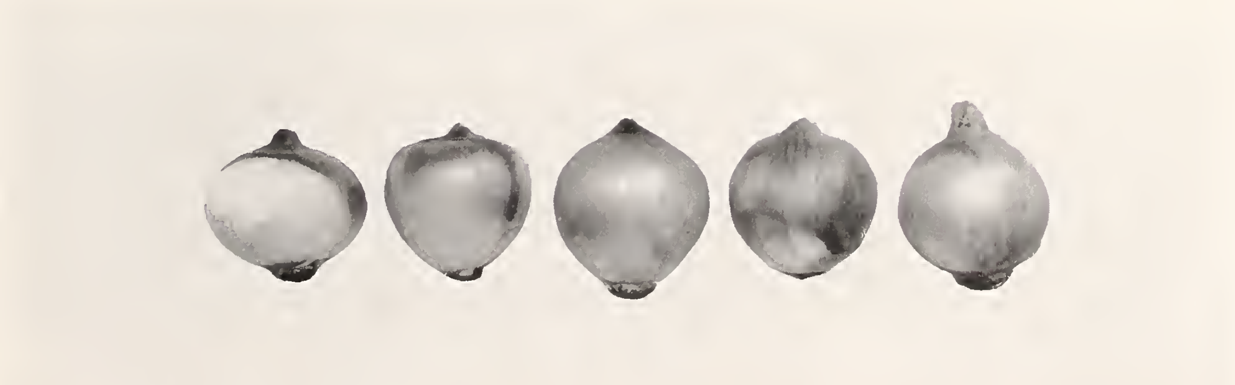
EARLY GRANO ONION



Columbus, Ohio



Farmington, Utah



Winter Haven, Tex.

An acceptable range in type of large and very large bulbs of the same stock of Early Grano onion grown in different locations and seasons. X 1/3. The second and third bulbs from the left in the Texas range are most typical in shape.

EARLY YELLOW GLOBE

BRIEF CHARACTERIZATION

The most important variety grown from seed in the Connecticut River Valley of Massachusetts and the Orange County section of New York. Also adapted to other northern onion-growing sections but not to the Southern States. May be successfully stored until after the first of the year.

Second early in season of maturity; the medium-size, slightly flattened, globe-shaped bulbs have a medium number of medium-thick, medium-yellow, dry scales that are fairly well retained during handling and storage. The flesh is medium firm and strong or pungent in flavor.

ADAPTABILITY AND USE

Early Yellow Globe is a relatively new early maturing variety of increasing importance in the northern onion-growing sections, as its early maturity enables it to make a good crop in seasons when thrips severely damage later maturing varieties. It is extensively used for the crop grown from seed in the Connecticut River Valley of Massachusetts and has practically supplanted Yellow Globe Danvers in this region and in the Orange County section of New York. It is not adapted to the Southern States because of the length of day required for bulb formation. When properly matured it may be stored a medium length of time, i. e., until sometime in January. Medium-pungent flesh; used for all culinary purposes.

SEASON

Second early in maturity: when sown in December or January and transplanted into the fields in late March in central California maturity takes place during the latter half of July; when seed is sown in the greenhouse during December and January and the plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., during the first week in July, at Farmington, Utah, about the middle of July, in north-central Ohio and California during the third week in July, and at Amherst, Mass., about the first of August.

PLANT

Medium height; the longest leaves usually reaching an average height of 18 to 24 inches (46 to 61 cm.) at the maximum vegetative stage of development.

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 6 to 10 depending largely upon the length and kind of growing season; longest leaf is from 16½ to 22 inches (42 to 56 cm.) in average length in the Northern and Eastern States and 24 inches (61 cm.) in California; average width is fourteen thirty-seconds to nineteen thirty-seconds of an inch (11 to 15 mm.), and average depth is 70 to 85 percent of the width. Mature leaves blue green, approximately 22 A 6 to 23 A 6, but with the heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 1⅞ to 2¾ inches (50 to 70 mm.) above the soil surface in the Northern and Eastern States and about 4¾ inches (120 mm.) in California and Texas; midheight diameter averages thirteen thirty-seconds to eighteen thirty-seconds of an inch (10 to 14 mm.) in the Northern and Eastern States and twenty-one thirty-seconds to twenty-five thirty-seconds of an inch (17 to 20 mm.) in California and Texas. The outer succulent layer just below the leaves on young plants is very pale green (18 B 2) with darker green veins, but on older plants the veins become yellowish brown with a light-yellow suffusion between them. As the outer layers age and dry the color deepens to yellowish buff.

MATURE CURED BULB

(Pls. 10 and 11)

Medium size; majority of bulbs 2 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 1.7 to 3.5 ounces (50 to 100 g.), diameter divided by depth index of 1.0 to 1.5, round to medium oblate in general shape with the upper half of bulb slightly rounded to slightly tapered to a small well-filled neck and the lower half slightly rounded to round.

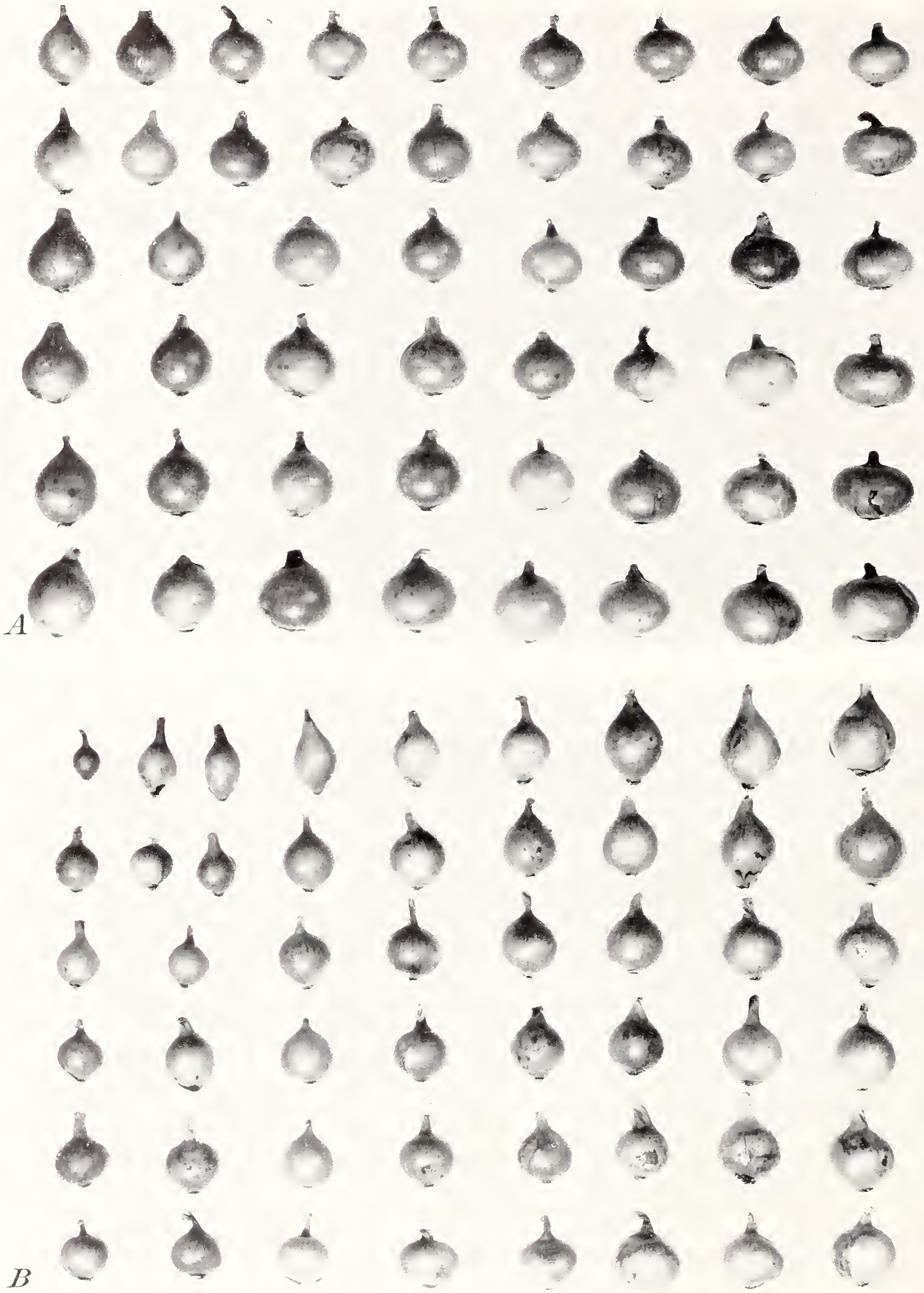
The outer intact dry scales soon after curing are medium in number, medium in thickness, fair to good retention during handling and storage, shiny medium-orange yellow (11 C 7) at midlength, with more yellow (9 E 2) at the base and more brown (12 D 8) toward the neck (pl. 1). The entire bulb becomes duller and more brown with age.

Epidermis of outer fleshy scales pale yellow (10 H 1) in color with succeeding scales lighter yellow and the center almost white. Flesh with epidermis removed is near white in color, but in cross section with epidermis in place the flesh is very pale yellow (10 F 1) shading to near white in the center, fairly firm, and strong in flavor.

HISTORY

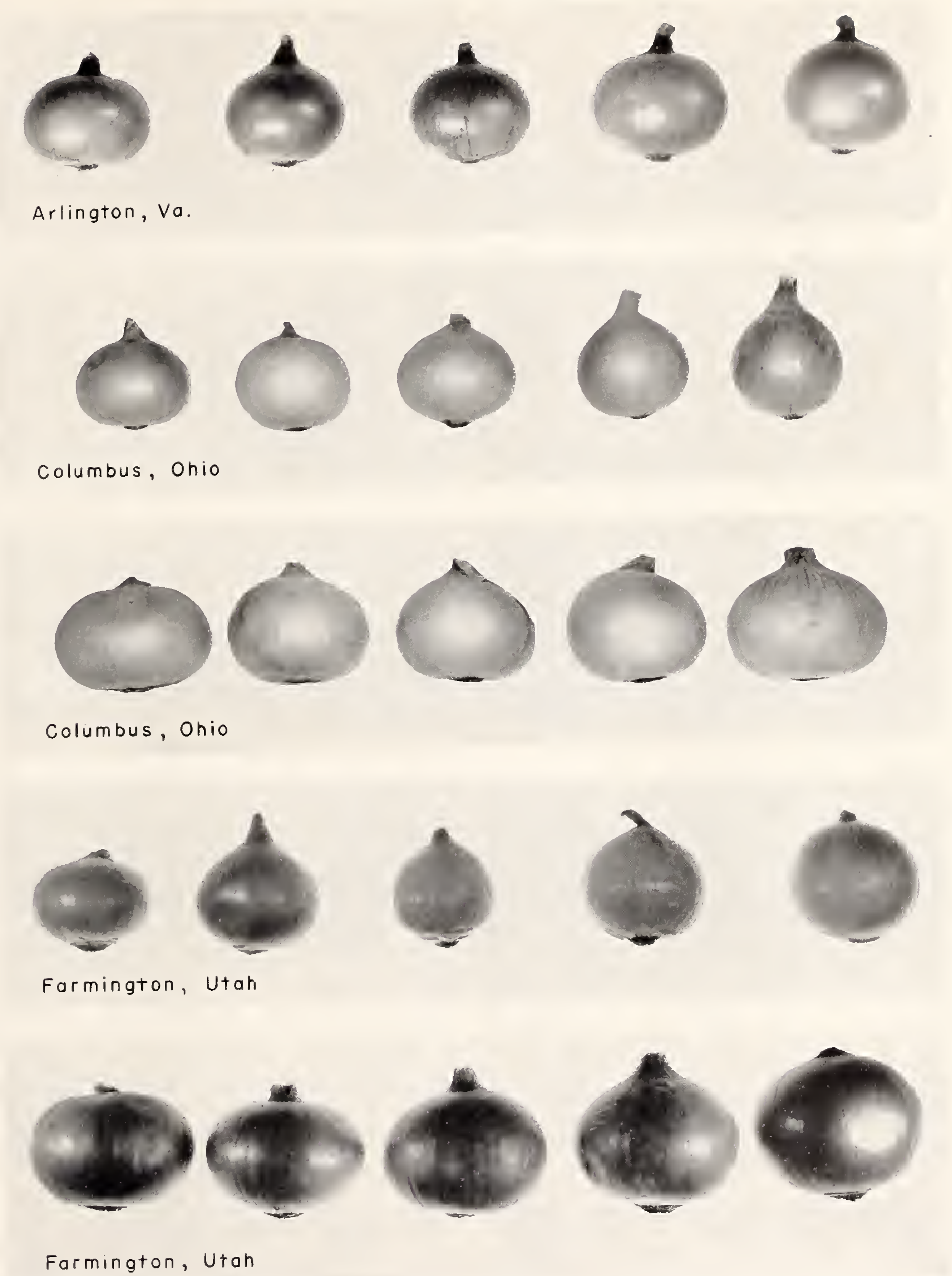
Selected from Extra Early Yellow, which was originally a selection from Yellow Globe Danvers made in Orange County, N. Y., and first listed in the 1931 catalog of F. H. Woodruff & Sons.

EARLY YELLOW GLOBE ONION



Random samples of the same stock of Early Yellow Globe onion showing the difference in size and shape when grown in a favorable season (A) as compared with an unfavorable season (B) at Arlington, Va. X 1/5. Note also the tendency of the smaller bulbs to be more oval or obovate in shape.

EARLY YELLOW GLOBE ONION



An acceptable range in type of large and very large bulbs grown at Columbus, Ohio, and Farmington, Utah, and large bulbs grown at Arlington, Va., from the same stock of Early Yellow Globe onion seed. X 1/3. *The fifth bulb from the left in the Virginia range is most nearly ideal in shape.*

EBENEZER

BRIEF CHARACTERIZATION

Extensively used for the production of yellow onion sets. Adapted to all northern onion-growing sections, but not to the southern sections. A good storage variety.

Second early in maturity; the medium-size, oblate or flattened globe-shaped bulbs have a medium number of medium-thick, pinkish- to browninsh-yellow dry skins that are well retained during handling and storage. The flesh is medium to hard and very strong or pungent in flavor.

ADAPTABILITY AND USE

Practically all of the yellow onion sets are of the Ebenezer variety, as this variety makes nearly round, bright yellowish buff sets of very good keeping qualities. The crop grown from sets matures early, is of good size, color, and storage quality. Commercial acreages of market bulbs are grown from sets in New York State, on the eastern shore of Maryland and Virginia, in the Connecticut River Valley, and on market gardens near the larger cities in the Northern States. Market gardeners and home gardeners throughout the United States use the sets for the production of bunch or green onions. They will not make good dry bulbs in the Southern States. The flesh is firm, pungent, and used for all culinary purposes.

SEASON

Second early in maturity; when sown in December or January and transplanted into the fields in late March in central California maturity takes place the last third of July; when seed is sown in December or January in greenhouses and the plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., about July 10, at Farmington, Utah, during the third week in July, in north-central Ohio during the fourth week in July, and at Amherst, Mass., during the first third of August. Seed sown in the field at the same time the green plants are set mature bulbs from 1 to 2 weeks later than do green plants or dry sets. Medium-size dry sets and well-grown green plants one-eighth of an inch or larger in diameter mature their bulbs about the same time when planted on the same date.

PLANT

Medium height; the longest leaves usually reaching an average height of 20½ to 26 inches (52 to 66 cm.) at the maximum vegetative stage of development with individuals as short as 16 inches (41 cm.) and as tall as 31½ inches (80 cm.).

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 7 to 11, depending largely upon the length and kind of growing season; longest leaf is from 18 to 24 inches (46 to 61 cm.) in average length in Northern and Eastern States and 26 inches (66 cm.) in California; average width is fifteen thirty-seconds to twenty thirty-seconds of an inch (12 to 16 mm.) and average depth is 65 to 85 percent of the width. Mature leaves blue green, approximately 22 A 6 to 23 A 6, but with the heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 1½ to 2⅜ inches (40 to 60 mm.) above the soil surface in the Northern and Eastern States and 4 to 4¾ inches (100 to 120 mm.) in California and Texas; midheight diameter averages fifteen thirty-seconds to twenty-one thirty-seconds of an inch (12 to 17 mm.) in the Northern and Eastern States, and twenty-two thirty-seconds to twenty-seven thirty-seconds of an inch (18 to 22 mm.) in California and Texas.

The outer succulent layer just below the leaves on young plants is very pale green (18 B 2) with darker green veins, but on older plants the veins become yellowish brown with a pinkish-yellow suffusion between them. As the outer layers age and dry they become pinkish buff.

MATURE CURED BULB

(Fig. 1, pls. 1, 12, and 13)

Medium size (diameter); majority of bulbs, 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 1.7 to 3.4 ounces (50 to 95 g.), diameter divided by depth ratio of 1.25 to 1.75, flat oblate to medium oblate in general shape with the upper half slightly rounded to slightly tapered to a small, well-filled neck and the lower half flat to slightly rounded in shape.

The outer intact dry scales soon after curing are medium in number, medium in thickness, and well retained during handling and storage, bright light pinkish yellow (10 C 6) at midlength with more yellow at base (9 E 2) and more brown (12 D 8) around the neck (pl. 1). Dry scales soon become as brown as Southport Yellow Globe (pl. 1) and duller with age.

Epidermis of outer fleshy scale light yellow (9 C 1) with succeeding scales lighter yellow and the center almost white. Flesh with epidermis removed is near white (10 A 1), but in cross section with epidermis in place the flesh is very pale yellow (9 B 1) shading to near white in the center, medium firm, very strong in flavor, and high in percentage of dry matter.

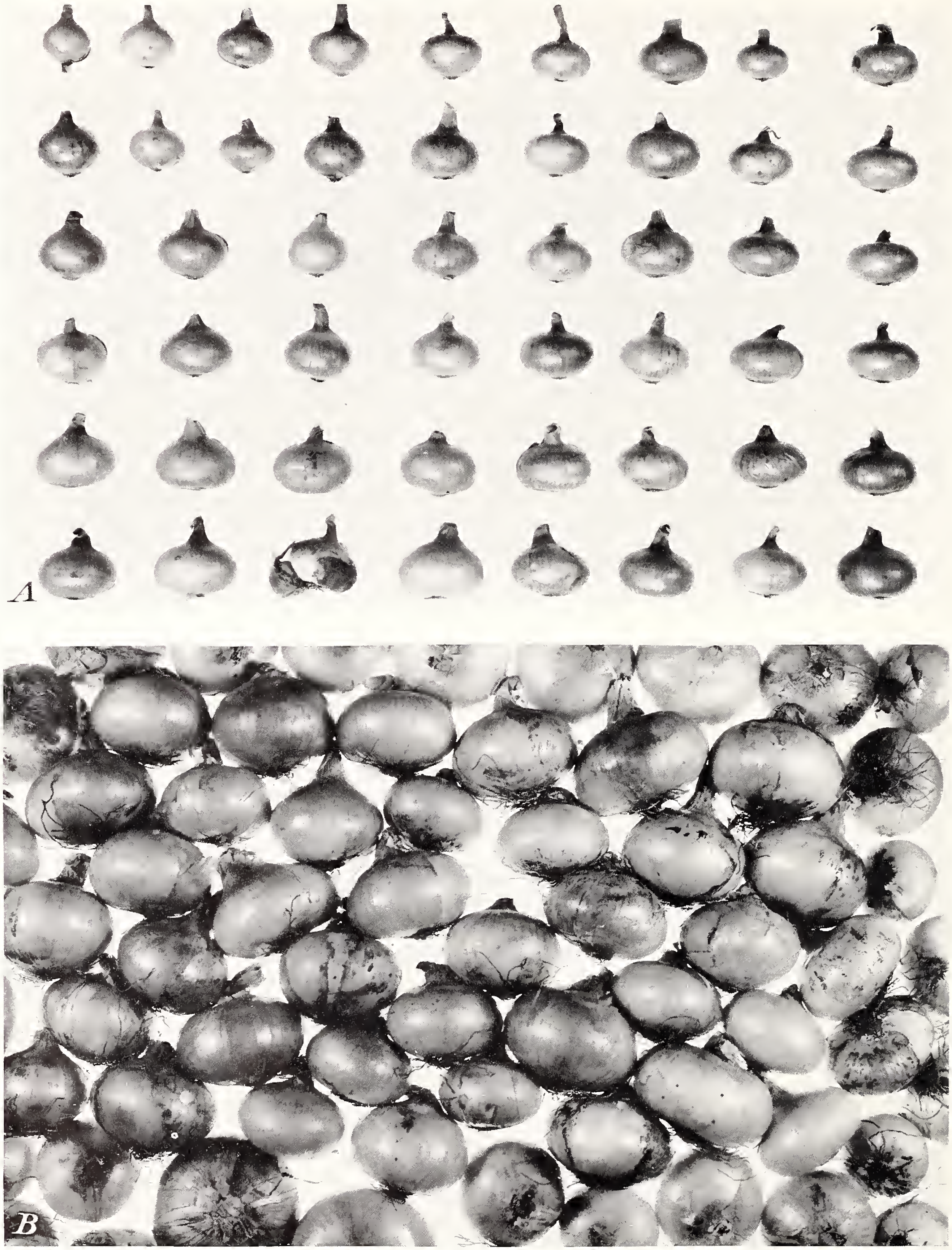
SYNONYMS

Japanese, Long Keeping, and New Ebenezer.

HISTORY

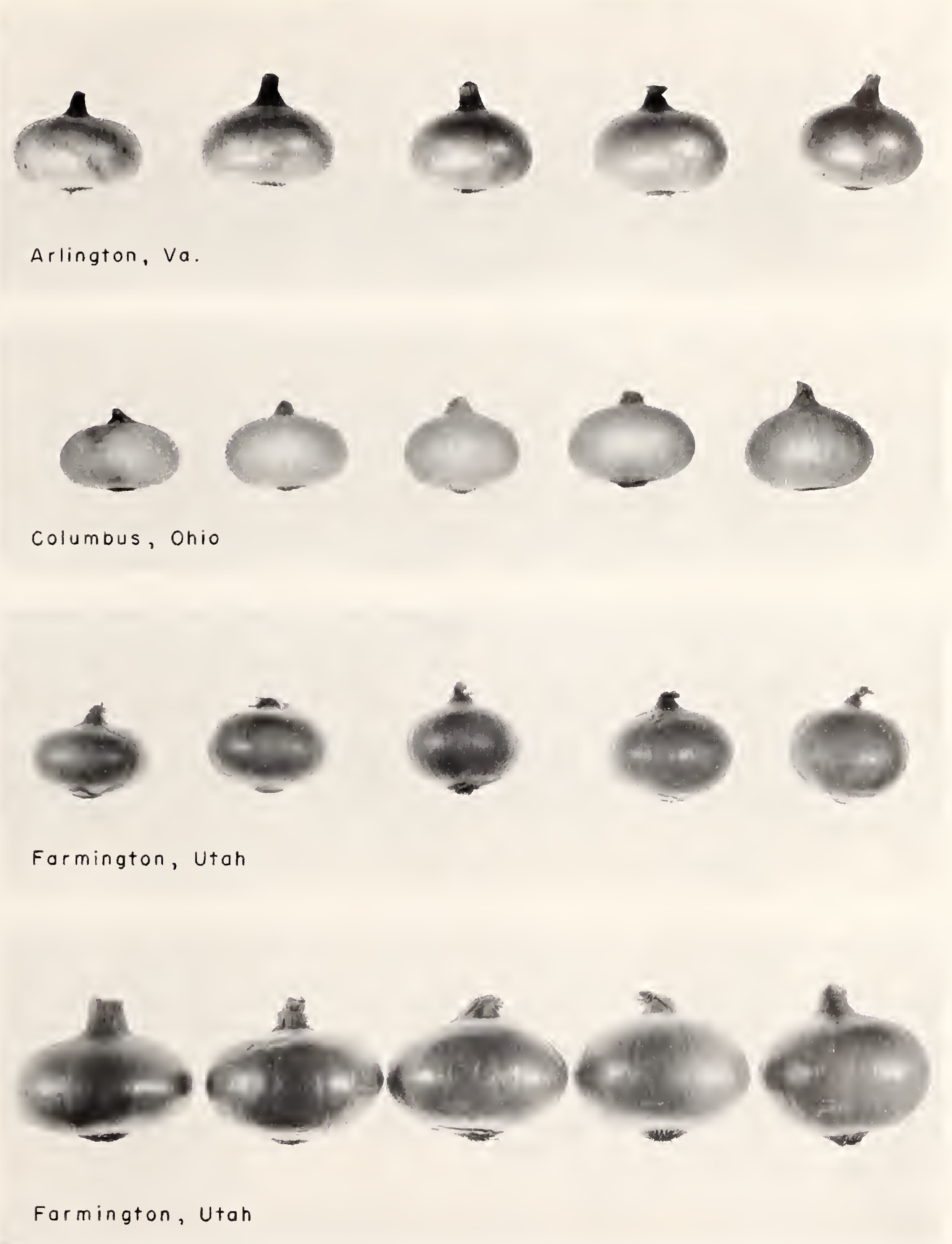
This name has been known on the Buffalo, N. Y., market for many years with reference to onions from the Ebenezer section south of Buffalo. The variety was developed after many years' selection, probably from some European variety introduced or imported by the German settlers in the vicinity. The same type, but under the name Japanese, was reintroduced in 1916 and widely distributed throughout the Eastern States by F. H. Woodruff & Sons, who obtained it from an old gardener in New York who had had it in his possession for many years.

EBENEZER ONION



Random samples of the same stock of Ebenezer onion grown (A) *at Arlington, Va.* (X 1/5), *and* (B) *at Terminus, Calif.* (X 1/3), *showing range in shape with size and location.*

EBENEZER ONION



An acceptable range in type of large bulbs grown in different locations and seasons, and very large bulbs from Farmington, Utah, from the same stock of Ebenezer onion. X 1/3. The third bulb from the left in the Virginia range is most nearly ideal in shape.

ITALIAN RED

BRIEF CHARACTERIZATION

A market gardener's variety from central California that is not well adapted to all northern onion-growing sections because of its failure to ripen properly and its susceptibility to bulb rots in humid regions. Not adapted to the Southern States or for storage.

Midseason to late in maturity; the large to very large, torpedo- or long oval-shaped bulbs have very few medium-thick, purplish-red dry skins that are soon broken and lost in handling. The flesh is soft, easily bruised and subsequently discolored, and very mild and sweet.

ADAPTABILITY AND USE

Italian Red is a very productive variety adapted to central California as a late-intermediate crop for immediate local consumption. It bruises easily and subsequently discolors badly in shipment and has a very short storage life. One of the few nonbolting varieties when grown for the intermediate crop in California. As most of the bulb forms above the soil level, it may be successfully grown on heavier soil types than other varieties. Not adapted to the Southern States because of the length of day required for bulb formation nor to humid or northern regions because of its extreme susceptibility to various bulb rots. Strains of this variety have been found that are highly mildew-resistant (*38*). Highly esteemed for salad and garnish purposes because of its attractive color and very mild and sweet flesh.

SEASON

Midseason to late in maturity; when sown in late August or early September in central California and set in the fields in November or December it usually matures in late July; when seed is sown in the greenhouse during December and January and the plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., about the first of August, and about the middle of August in north-central Ohio, Amherst, Mass., and Farmington, Utah. Because of the shape of the top of the bulb the foliage does not fall over as readily as in most other varieties, and it is therefore difficult to judge maturity.

PLANT

Medium height; the longest leaves usually reaching an average height of 18 to 22 inches (46 to 56 cm.) at the maximum vegetative stage of development in the Northern States and 30 to 36 inches (76 to 92 cm.) when grown as an intermediate crop in California.

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 6 to 12 depending largely upon the length and kind of growing season; longest leaf is from 14 to 17 inches (36 to 43 cm.) in average length in the Northern and Eastern States but may attain an average of 24 inches (61 cm.) in California when sown in the fall; average width is thirteen thirty-seconds to eighteen thirty-seconds of an inch (10 to 14 mm.) and average depth is 65 to 85 percent of the width. Mature leaves blue green, approximately 22 A 6 to 23 A 6, but with the heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 1½ to 2¾ inches (40 to 70 mm.) above the soil surface in the Northern and Eastern States and 5 to 6 inches (130 to 150 mm.) in California; midheight diameter averages seven-sixteenths to ten-sixteenths of an inch (11 to 16 mm.) in the Northern and Eastern States and thirteen-sixteenths of an inch (21 mm.) in California. Color of the sheath column is the same as for California Early Red.

MATURE CURED BULB

(Pl. 14)

Small in diameter in the Northeastern States, majority of bulbs 1.5 to 2.0 inches in diameter (3.8 to 5.1 cm.), weight of 1.6 to 3.3 ounces (45 to 95 g.), diameter divided by depth ratio of 0.4 to 0.6. In

California it attains medium to large diameter, majority of bulbs 2.5 to 3.0 inches in diameter (6.3 to 7.6 cm.), weight of 5.6 to 11.3 ounces (160 to 320 g.), diameter divided by depth ratio of 0.5 to 0.75. Long oval- or torpedo-shaped with the upper half long-tapered to a medium-size, poorly filled neck, and the lower half oval to short-tapered.

The outer intact dry scales soon after curing are very few in number, thin to medium in thickness, soon broken and lost in handling, shiny medium reddish purple (4 H 5) at midlength with brighter purple (5 A 6) at base and more buff (near 4 G 9) toward neck. (See California Early Red, pl. 1.) The dry scales become dull and more buff in color with age.

Epidermis of outer fleshy scale light reddish purple (51 F 7) with succeeding scales lighter toward the center, which is very pale purplish pink (50 A 2). Flesh with epidermis removed is near white (50 A 1), but in cross section with epidermis in place the flesh is pale purplish pink (51 D 2 to 50 A 2) fading somewhat toward center of bulb, very soft, very mild in flavor, and low in percentage of dry matter.

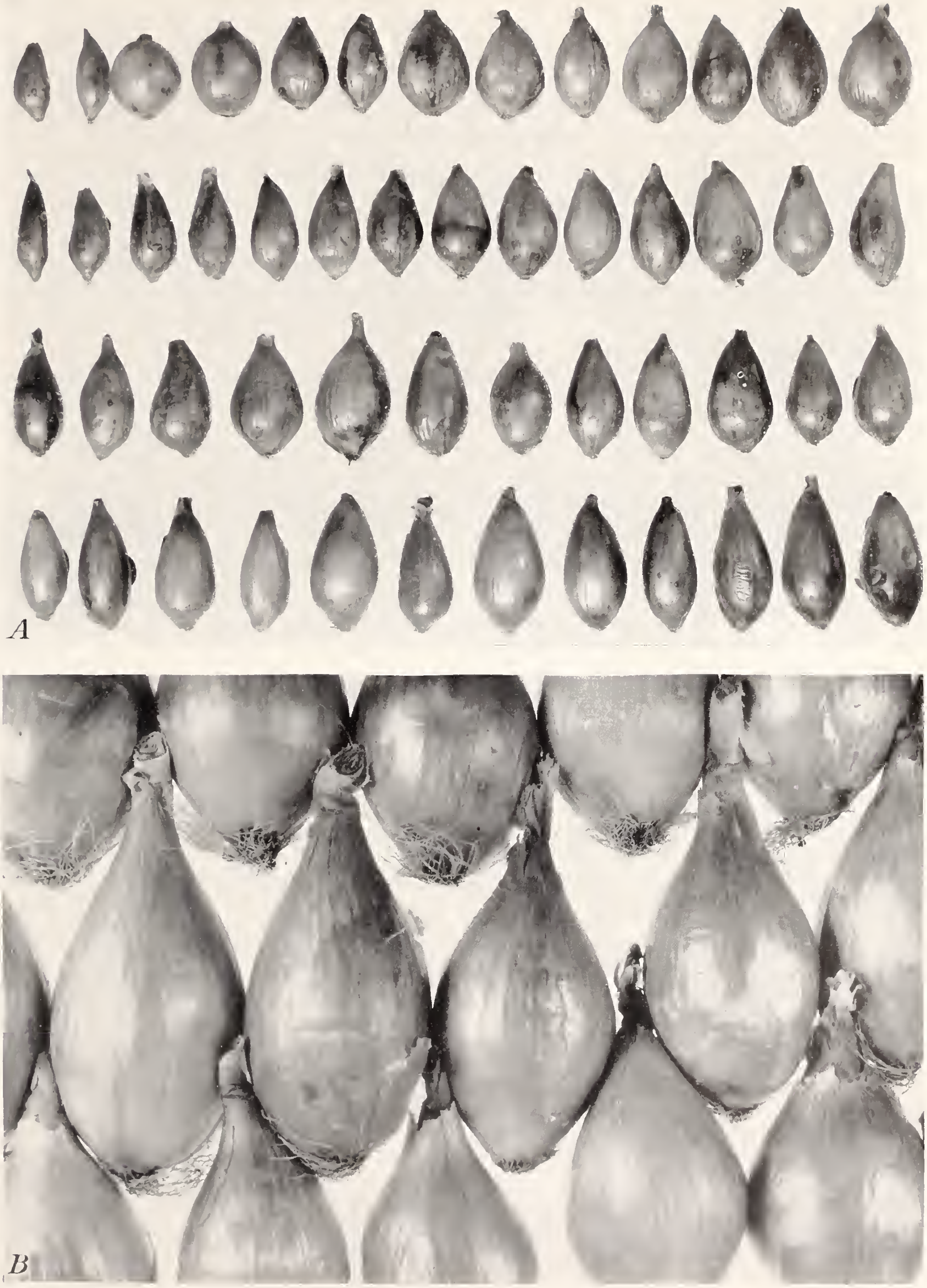
SYNONYMS

Bottleneck and Torpedo.

HISTORY

Reported to be a selection from California Early Red by market gardeners in the Sacramento Valley of California and first listed by F. Lagomarsino & Sons, Sacramento, Calif.

ITALIAN RED ONION



Random samples of the same stock of Italian Red onion grown (A) at Arlington, Va. (X 1/5), and (B) at Davis, Calif. (X 1/2.5), showing range in shape with size and location.

MOUNTAIN DANVERS

BRIEF CHARACTERIZATION

Supplanted in the northeastern onion sections by Early Yellow Globe but still grown in the higher altitudes of Colorado and other Mountain States. Not adapted to the Southern States. A fair storage variety.

Second early in season of maturity; the medium-size, round to slightly flattened globe-shaped bulbs have a medium number of medium to thick, brownish-yellow dry skins that are retained fairly well during storage and handling. The flesh is fairly firm and strong or pungent in flavor.

ADAPTABILITY AND USE

Mountain Danvers is extensively grown in the higher altitudes of Colorado and the more northern sections of other States or in sections of the Northern States where early maturity and heavy yellowish-brown bulb scales are desired. Not quite as early nor as productive in the Eastern States as Early Yellow Globe and therefore being supplanted by that variety. May be stored until January without excessive losses when properly matured, but is not as good a keeper as other later maturing varieties. It is not adapted to southern onion-growing regions because of the length of day required for bulb formation.

The firm medium-pungent flesh is used for all culinary purposes.

SEASON

Second early in maturity; when sown in December or January and transplanted into the fields in late March in central California maturity takes place during the latter half of July; when seed is sown in the greenhouse during December and January and the plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., during the first week in July, at Farmington, Utah, about the middle of July, in north-central Ohio and California during the third week in July, and at Amherst, Mass., about the first of August.

PLANT

Medium height; the longest leaves usually reaching an average height of 19 to 24 inches (48 to 61 cm.) at the maximum vegetative stage of development with individuals as short as 11 inches (28 cm.) and as tall as 31½ inches (80 cm.).

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 6 to 10 depending largely upon the length and kind of growing season; longest leaf is from 18 to 22 inches (46 to 56 cm.) in average length in the Northern and Eastern States and 24 inches (61 cm.) in California. average width is seven-sixteenths to ten-sixteenths of an inch (11 to 15 mm.), and average depth is 75 to 85 percent of the width. Mature leaves blue green, approximately 22 A 6 to 23 A 6, but with the heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 1⅞ to 2¾ inches (50 to 70 mm.) above the soil surface in the Northern and Eastern States and 4 to 4¾ inches (100 to 120 mm.) in California; midheight diameter averages fifteen thirty-seconds to nineteen thirty-seconds inch (12 to 15 mm.) in the Northern and Eastern States and twenty-one thirty-seconds to twenty-five thirty-seconds inch (17 to 20 mm.) in California. The outer succulent layer just below the leaves on young plants is very pale green (18 B 2) with darker green veins, but on older plants the veins become yellowish brown with a light-yellow suffusion between them. As the outer layers age and dry the color deepens to yellowish buff.

MATURE CURED BULB

(Pls. 15 and 16)

Medium size; majority of bulbs 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 1.7 to 3.3 ounces

(50 to 95 g.), diameter divided by depth ratio of 1.05 to 1.60, medium to deep oblate in general shape with the upper half rounded to slightly tapered to a small well-filled neck and the lower half slightly rounded to round.

The outer intact dry scales soon after curing are medium in number, medium to thick, fair to good in retention of the scales during handling and storage, shiny brownish yellow (11 B 9) at midlength with more yellow (9 E 2) at the base and more brown (12 C 10) toward the neck. The entire bulb becomes duller and more brown with age.

Epidermis of outer fleshy scale pale yellow (10 H 1) with succeeding scales lighter yellow and the center almost white. Flesh with epidermis removed is near white in color, but in cross section with epidermis in place the flesh is very pale yellow (10 F 1) shading to near white in the center, fairly firm, strong in flavor, and low to medium percentage of dry matter.

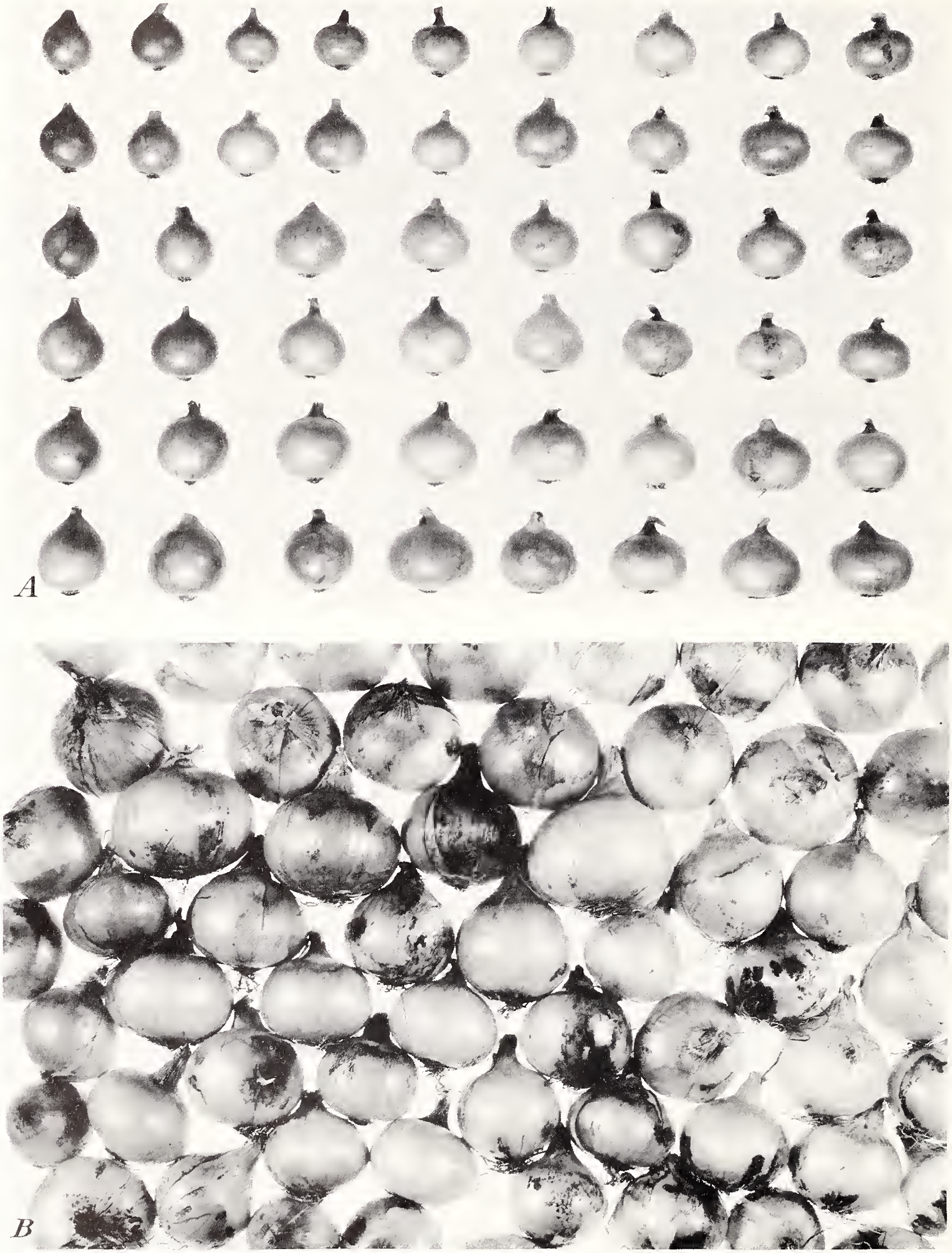
SYNONYMS

Mountain Globe, Mountain Yellow Globe, and Special Yellow Globe.

HISTORY

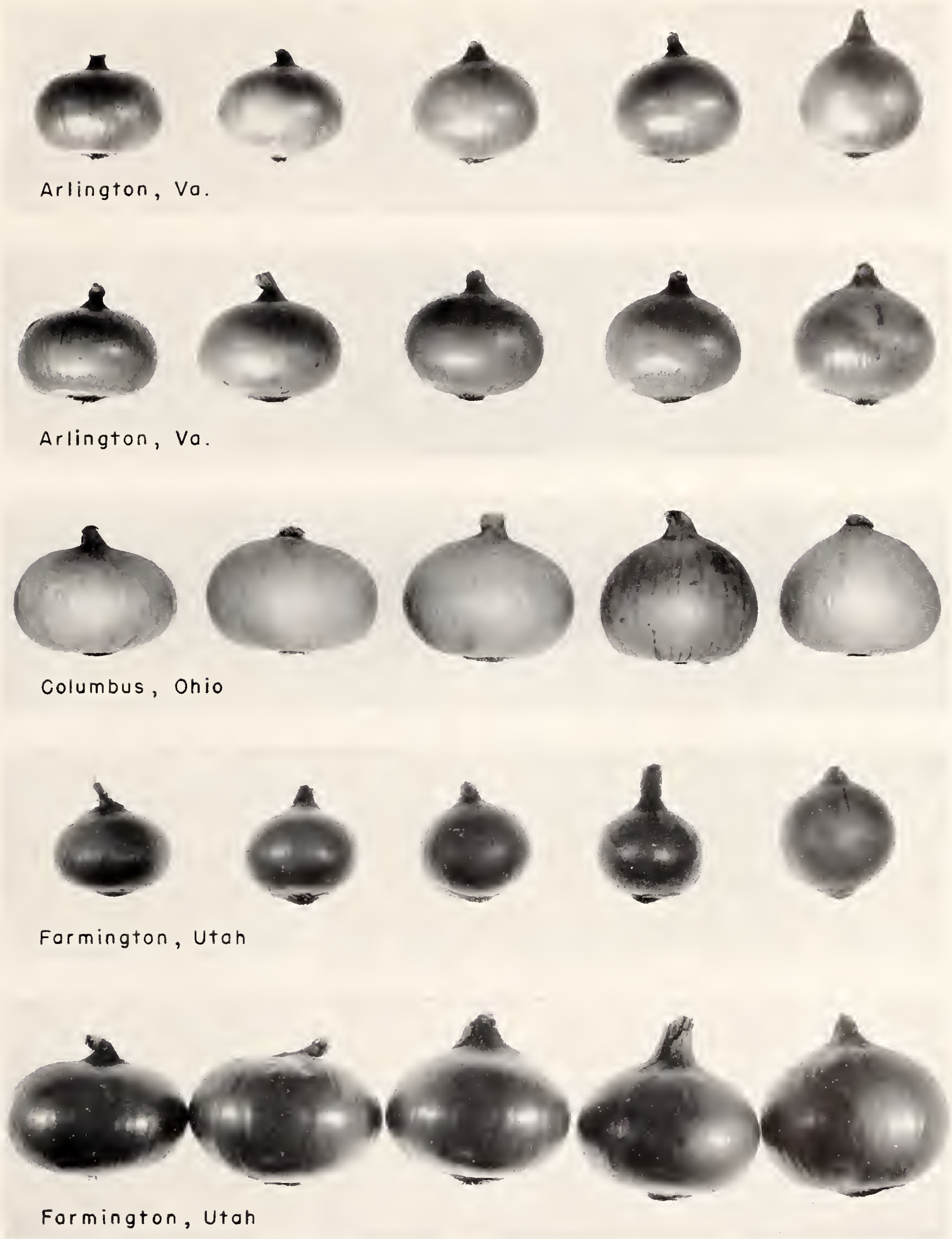
First listed under this name in the 1914 catalog of Henry Field Seed Co. and the result of many years' selection from Yellow Globe Danvers by growers in Montrose County, Colo. The type description is based on the stock perfected by A. L. Franklin, Delta, Colo.

MOUNTAIN DANVERS ONION



Random samples of the same stock of Mountain Danvers onion grown (A) at Arlington, Va. (X 1/5), and (B) at Terminus, Calif. (X 1/3), showing range in shape with size and location.

MOUNTAIN DANVERS ONION



An acceptable range in type of large bulbs grown in different locations and seasons, and very large bulbs from Farmington, Utah, of the same stock of Mountain Danvers onion. X 1/3. *The third and fourth bulbs from the left in the Virginia range are most nearly ideal in shape.*

OHIO YELLOW GLOBE

BRIEF CHARACTERIZATION

A good storage variety that is especially adapted to muck or peat soils in the northern onion-growing sections. Not adapted to the Southern States.

Midseason in maturity; the medium-size, flattened-base, globe-shaped bulbs have a medium number of medium to thick, brownish-yellow dry skins that are well retained during handling and storage. The flesh is medium hard and strong or pungent in flavor.

ADAPTABILITY AND USE

The Ohio Yellow Globe is a midseason to late-maturing variety that is especially adapted for dry-bulb production on the muck or peat soils of the States adjoining the Great Lakes, in the Pacific Northwest, and in the Delta region of California. It is a productive, good storage variety with heavy deep yellowish-brown scales and firm, pungent flesh. Not adapted to the Southern States.

SEASON

Midseason in maturity: when sown in December or January and set in the fields in late March in central California maturity takes place the last week in July; when seed is sown in greenhouses in December or January and the plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., about the middle of July, at Farmington, Utah, during the last week in July, in north-central Ohio during the first week in August, and at Amherst, Mass., about August 15.

PLANT

Medium height; the longest leaves usually reaching an average height of 21 to 25 inches (53 to 64 cm.) at the maximum vegetative stage of development with individuals as short as 13¾ inches (35 cm.) and as tall as 33 inches (84 cm.).

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 7 to 11 depending largely upon the length and kind of growing season; longest leaf is from 17¼ to 24 inches (44 to 61 cm.) in average length in the Northern and Eastern States and 26 inches (66 cm.) in California; average width is fourteen thirty-seconds to nineteen thirty-seconds of an inch (11 to 15 mm.) and average depth is 75 to 90 percent of the width. Mature leaves blue green, approximately 22 A 6 to 23 A 6, but with the heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 1⅞ to 3⅛ inches (50 to 80 mm.) above the soil surface in the Northern and Eastern States and 4 to 4¾ inches (100 to 120 mm.) in California; midheight diameter averages fifteen thirty-seconds to twenty thirty-seconds of an inch (12 to 16 mm.) in the Northern and Eastern States and twenty thirty-seconds to twenty-five thirty-seconds of an inch (16 to 20 mm.) in California and Texas.

The outer succulent layer just below the leaves on young plants is very pale green (18 B 2) with darker green veins, but on older plants the veins become yellowish brown with a light-yellow suffusion between them. As the outer layers mature and dry the color deepens to yellowish buff.

MATURE CURED BULB

(Pls. 17 and 18)

Medium size; majority of bulbs, 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 2.1 to 3.5 ounces (60 to 100 g.), diameter divided by depth ratio of 0.9 to 1.4, obovate in general shape with the upper half oval to tapered to a medium-size, well-filled neck and the lower half flat to slightly rounded.

The outer intact dry scales soon after curing are medium in number, medium to thick, fairly well retained during handling and storage, shiny brownish yellow (11 B 9) at midlength with more yellow (9 E 2) at the base and more brown (12 C 10) toward the neck. The entire bulb becomes duller and browner with age.

Epidermis of outer fleshy scales pale yellow (10 H 1) with succeeding scales lighter yellow and the center almost white. Flesh with epidermis removed is near white in color, but in cross section with epidermis in place the flesh is very pale yellow (10 F 1) shading to near white in center, fairly firm, strong in flavor, and medium in percentage of dry weight.

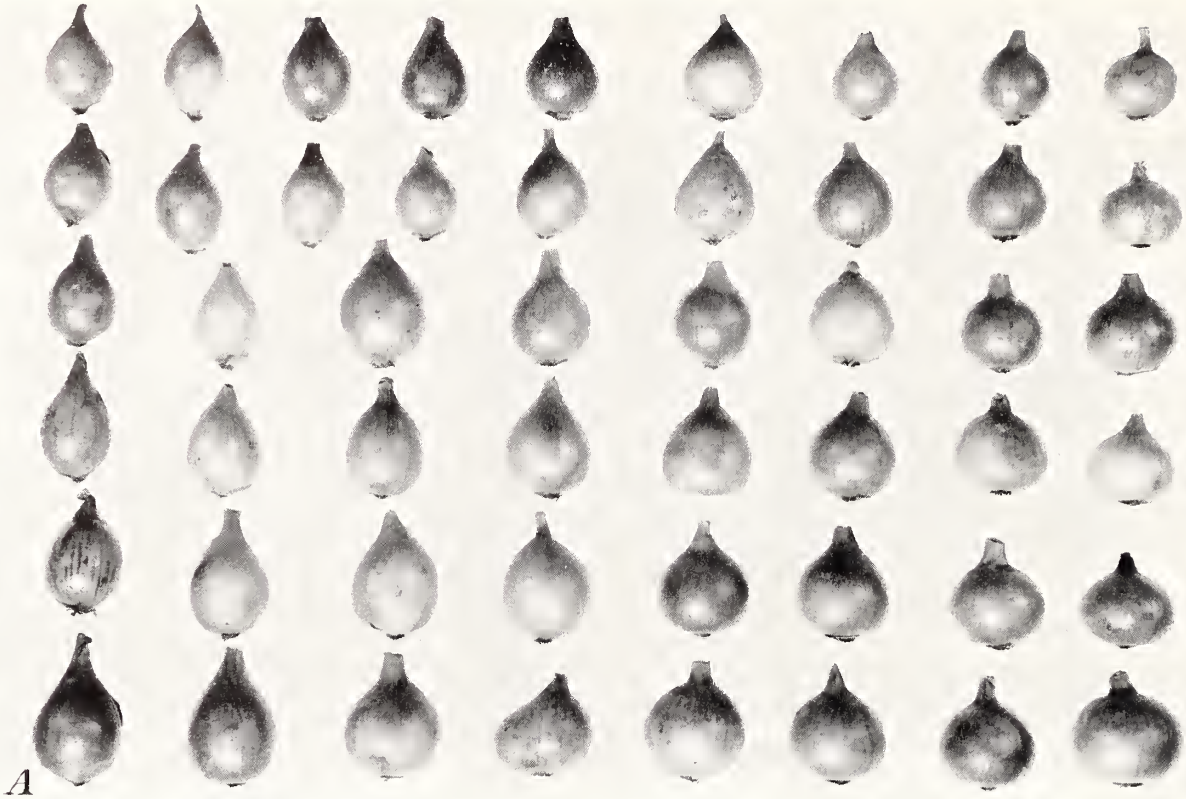
SYNONYMS

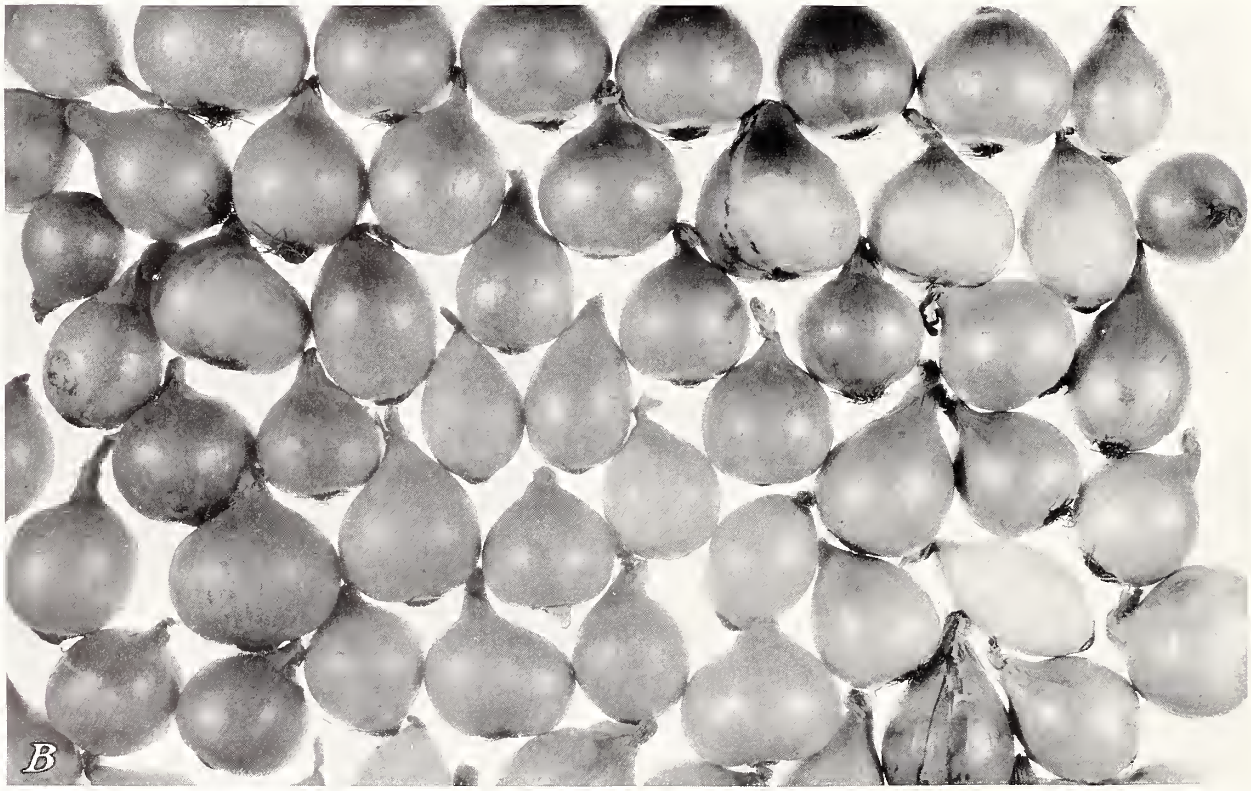
Michigan Globe Danvers, Michigan Yellow Globe, Ohio Globe Danvers, Ohio Yellow Globe Danvers.

HISTORY

This type was developed by and first listed in the 1889 catalog of D. M. Ferry & Co. as Michigan Yellow Globe and later renamed Ohio Yellow Globe by a number of seedsmen. It is now generally recognized that the two names are synonyms, and the preference of the majority has been followed in the selection of the name.

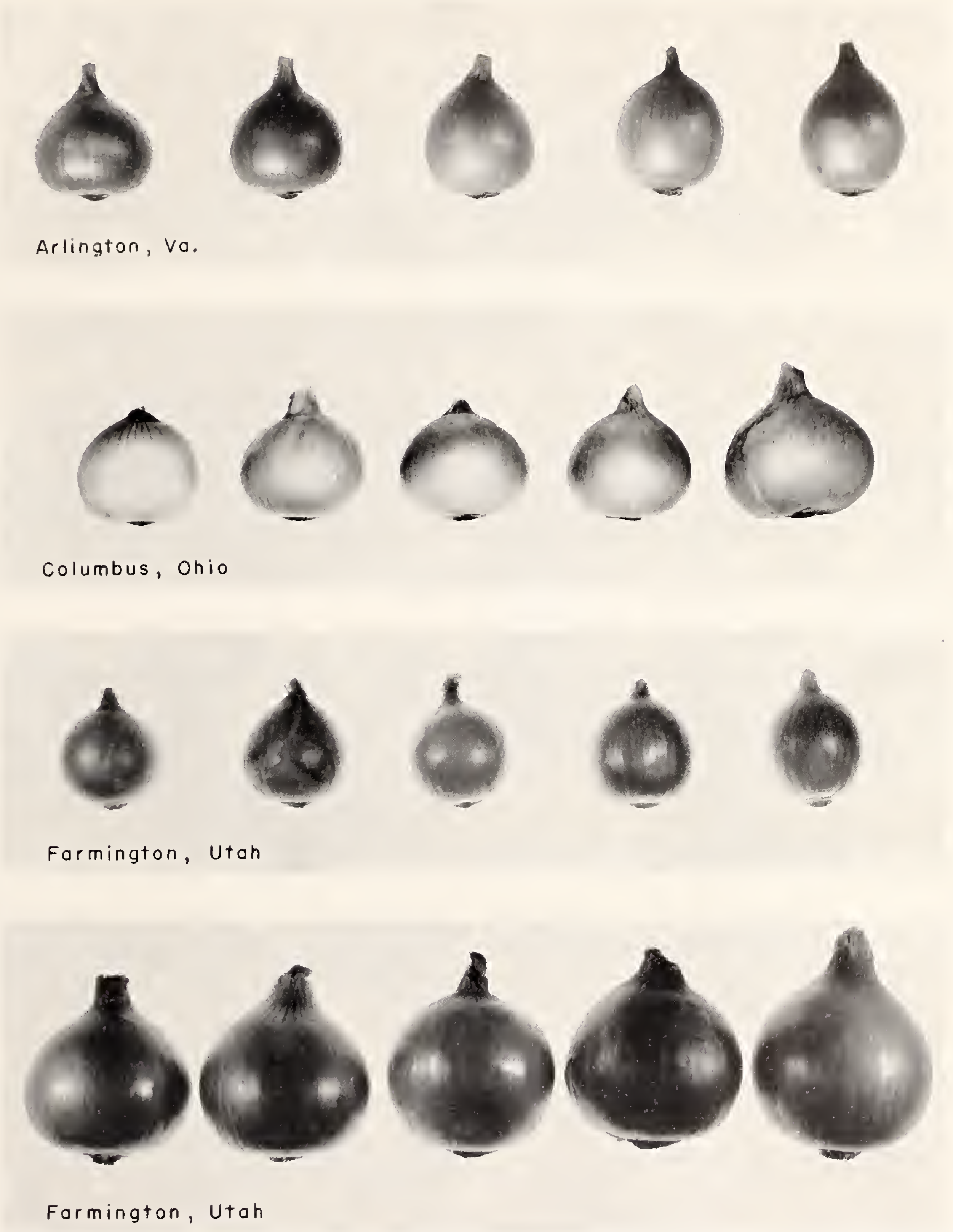
OHIO YELLOW GLOBE ONION





Random samples of the same stock of Ohio Yellow Globe onion grown (A) at Arlington, Va. (X 1/5), *and* (B) *at Terminus, Calif.* (X 1/3), *showing range in shape with size and location.*

OHIO YELLOW GLOBE ONION



An acceptable range in type of large bulbs grown in different locations and seasons, and very large bulbs from Farmington, Utah, of the same stock of Ohio Yellow Globe onion, except that the fifth bulb from the left of the Virginia range and the fifth bulb from the left of the large bulbs from Farmington are too long or deep. The third bulb from the left in the Virginia range is most nearly ideal in shape.

RED CREOLE

BRIEF CHARACTERIZATION

Adapted only to the southernmost sections of the United States or sections in the same latitude and important only in the region about New Orleans. A very good storage variety.

Early in maturity; the small to medium-size, oblate to flattened bulbs have a medium number of medium-thick reddish-buff, dry skins that are well retained during storage and handling. The flesh is very firm or hard and very strong or pungent in flavor.

ADAPTABILITY AND USE

Red Creole is of commercial importance only in the region about New Orleans, La., where it is the major type for home and market purposes, as it keeps better in open sheds or barns during the humid summers than any other variety. It may be grown in similar latitudes where the plants are not killed by the cold in the winter, but due to the small size of the bulb it is not as productive as the Bermudas or Early Grano. It should not be planted in the Northern States as the bulbs rarely exceed 1 inch in diameter. It has the highest dry-matter content of any of the varieties described herein except White Creole, and the flesh is very pungent and of firm texture.

SEASON

Very early maturing in the Northern States, being 5 to 15 days earlier than Yellow Bermuda. In Texas Red Creole is slightly later maturing than Yellow Bermuda. In the region about New Orleans, La., when sown in October and transplanted in early January it matures during the first half of May.

PLANT

Very short, the longest leaves usually reaching an average height of 8 to 12 inches (20 to 30 cm.), with individuals as short as 6 inches (15 cm.) and as tall as 15¾ inches (40 cm.) at maximum vegetative stage of development.

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 3 to 11 depending largely upon the length and kind of growing season; longest leaf is from 8 to 12 inches (20 to 30 cm.) in average length, average width is six thirty-seconds to nine thirty-seconds of an inch (5 to 7 mm.), and average depth 80 to 90 percent of the width. Mature leaves blue green, approximately 22 A 6 to 23 A 6, but with the heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 1¼ to 1½ inches (30 to 40 mm.) above the soil surface in the Northern and Eastern States and as much as 4 inches (100 mm.) in California and Texas; midheight diameter averages six thirty-seconds to seven thirty-seconds of an inch (5 to 6 mm.) in the Northern and Eastern States and thirteen thirty-seconds of an inch (10 mm.) in California and Texas. The outer succulent layer on young plants is very pale green (18 B 3) with darker green veins, but on older plants the veins of the basal portion become purplish brown (47 E 1) with a slight suffusion between the veins of pale pinkish purple (42 D 2). As the outer layers age and become dry the purple color fades from between the veins to a pinkish buff.

MATURE CURED BULB

(Pls. 1 and 19)

Medium size (diameter) in Texas and Louisiana; majority of bulbs 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 1.6 to 3.2 ounces (45 to 90 g.), diameter divided by depth ratio of 1.25 to 1.75, flat to medium oblate in general shape with the upper half slightly rounded to slightly tapered to medium-size, well-filled neck and the lower half flat to slightly rounded.

The outer intact dry scales soon after curing are medium in number, medium in thickness, and retained fairly well in handling and storage, dull buff red (4 J 7) on the lower half with more buff (4 C 10) in veins and on the upper half toward the neck. Dry scales become dull and more buff with age.

Epidermis of outer fleshy scales medium purplish red (52 C 5) with succeeding scales lighter in color (51 B 4 to 50 B 1) toward the center. Flesh with epidermis removed is near white (50 A 1), but in cross section with epidermis in place the flesh is pale purplish pink (51 B 1) shading to near white in the center, very firm, very strong in flavor, and very high in percentage of dry matter.

SYNONYMS

Creole, Louisiana Creole, Louisiana Red Creole, and Pale Red Creole.

HISTORY

This variety has been grown on Bayou Lafourche, La., for well over 100 years. The original variety from which it was developed is not known, although it is supposed to be of Italian origin. Local growers still maintain strains that have been in the family for generations and these strains differ slightly in type. The type herein described is based on a stock developed at the Louisiana Agricultural Experiment Station.

WHITE CREOLE

BRIEF CHARACTERIZATION

Adapted only to the southernmost sections of the United States or sections in the same latitude and important only in the region about New Orleans. A very good storage variety.

Early in maturity; the small- to medium-size, oblate to flattened bulbs have a medium number of medium-thick, shiny-white, dry skins that are well retained during storage and handling. The flesh is very firm or hard and very strong or pungent in flavor.

ADAPTABILITY AND USE

White Creole is adapted to the same region and for the same uses as Red Creole but is preferred for cooking because of the nearly white flesh.

SEASON

Very early maturing in the Northern States, being 5 to 15 days earlier than Yellow Bermuda. In Texas White Creole is slightly later maturing than Yellow Bermuda. In the region about New Orleans, La., when sown in October and transplanted in early January it matures during the first half of May.

PLANT

Very short, the longest leaves usually reaching an average height of 8 to 12 inches (20 to 30 cm.), with individuals as short as 6 inches (15 cm.) and as tall as 15¾ inches (40 cm.) at maximum vegetative stage of development.

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 3 to 11 depending largely upon the length and kind of growing season; longest leaf is from 8 to 12 inches (20 to 30 cm.) in average length; average width is six thirty-seconds to nine thirty-seconds of an inch (5 to 7 mm.) and average depth 80 to 90 percent of the width. Mature leaves blue green, approximately 22 A 6 to 23 A 6, but with the heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Size same as Red Creole but lacks the purplish and buff colors. The outer dry layers are almost white with the veins a light pinkish brown.

MATURE CURED BULB

(Pl. 19)

Medium size (diameter) in Texas and Louisiana; majority of bulbs 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 1.6 to 3.2 ounces (45 to 90 g.), diameter divided by depth ratio of 1.25 to 1.75, flat to medium oblate in general shape, with the upper half slightly rounded to slightly tapered to medium-size, well-filled neck and the lower half flat to slightly rounded.

The outer intact dry scales soon after curing are medium in number, medium in thickness, fairly well retained in handling and storage, shiny almost white (10 A 1) when freshly exposed but becoming dull with age with light-greenish or buff-colored veins around the neck (see White Portugal, pl. 1).

Epidermis of outer fleshy scales near white (10 A 1) except where the bulbs have been exposed to strong light during curing, when it becomes pale green with succeeding scales near white toward the center. Flesh with epidermis removed or in place is near white (10 A 1) in color, very firm, very strong in flavor, and very high in percentage of dry matter.

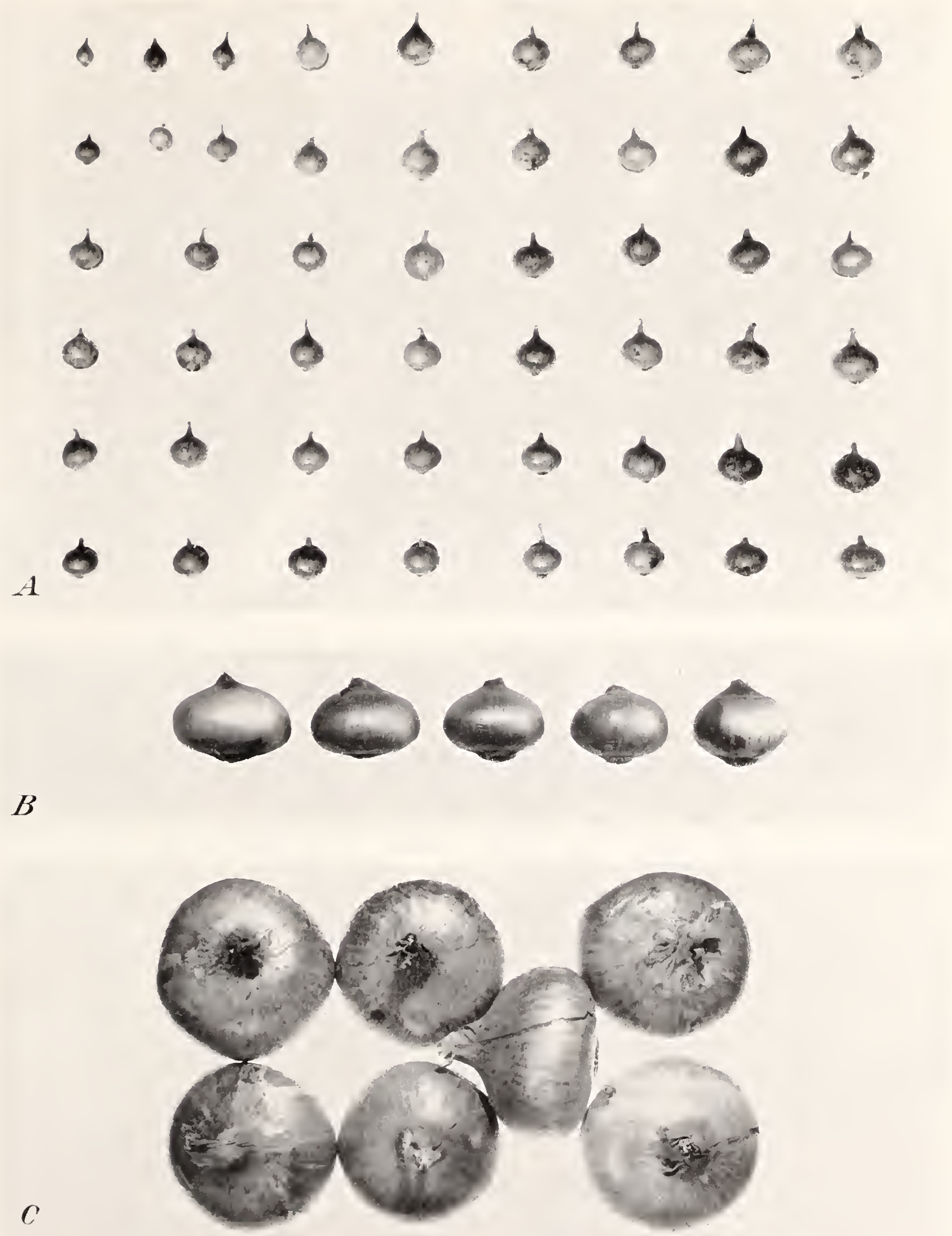
SYNONYMS

White Keeper and White Wonder.

HISTORY

This type was probably first described and listed in the 1904 catalog of the Texas Seed & Floral Co., Dallas, Tex., as White Wonder or White Creole.

RED CREOLE ONION



A, Size and shape of the larger bulbs of Red Creole onion grown at Arlington, Va. X 1/5. B, An acceptable range in shape of Red Creole onion grown at Winter Haven, Tex. X 1/3. The third bulb from the left is most nearly ideal in shape. C, Average size of Red Creole onion grown at Baton Rouge, La. X 1/2.

RED WETHERSFIELD

BRIEF CHARACTERIZATION

A very productive and fair storage variety that is now used almost exclusively for the production of red onion sets. Adapted to all northern onion-growing sections but not to the southern sections.

Midseason to late in maturity; the medium- to large-size, thick flat-shaped bulbs have a medium number of medium to thick, purplish-red, dry skins that are fairly easily broken and lost in handling and storage. The flesh is somewhat soft but strong or pungent in flavor.

ADAPTABILITY AND USE

Most of the red onion sets are of the Red Wethersfield variety, as they are more nearly round or keep better than sets of other red varieties. A decreasing acreage of dry bulbs is grown from seed in the Northern States. It is not adapted to the Southern States. It is very productive but only a fair storage variety. The flesh is moderately pungent, and the variety is used mostly for salad and garnish, as the color of the cooked product is objectionably dark.

SEASON

Midseason to late in maturity; when sown in December or January and set in the fields in late March in central California, maturity takes place the first week in August; when seed is sown in the greenhouse in December or January and the plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., about July 20, at Farmington, Utah, the first week in August, in north-central Ohio about August 10, and at Amherst, Mass., about August 20.

PLANT

Medium to tall; the longest leaves usually reaching an average height of 23½ to 27½ inches (60 to 70 cm.) at the maximum vegetative stage of development with individuals as short as 15¾ inches (40 cm.) and as tall as 34 inches (86 cm.).

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 7 to 11 depending largely upon the length and kind of growing season; longest leaf is from 20 to 24 inches (51 to 61 cm.) in average length in the Northern and Eastern States and 26 inches (66 cm.) in California; average width is fifteen thirty-seconds to twenty-one thirty-seconds of an inch (12 to 17 mm.) and average depth is 75 to 90 percent of the width. Mature leaves blue green, approximately 22 A 6 to 23 A 6, but with the heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 1⅞ to 2¾ inches (50 to 70 mm.) above the soil surface in the Northern and Eastern States and 4¾ to 6¼ inches (120 to 160 mm.) in California; midheight diameter averages fifteen thirty-seconds to twenty-one thirty-seconds of an inch (12 to 17 mm.) in the Northern and Eastern States and twenty-one thirty-seconds to twenty-seven thirty-seconds of an inch (17 to 22 mm.) in California. Color is indistinguishable from that of Southport Red Globe except that the metallic or bronzy purple on old dry layers is rarely seen in Red Wethersfield.

MATURE CURED BULB

(Pls. 1, 20, and 21)

Medium to large in diameter; majority of bulbs usually 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 1.9 to 3.5 ounces (55 to 100 g.), diameter divided by depth ratio of 1.1 to 1.7, but under very favorable conditions the majority of bulbs 2.5 to 3.0 inches in diameter (6.3 to 7.6 cm.), weight of 3.5 to 5.3 ounces (100 to 150 g.), diameter divided by depth ratio of 1.35 to 1.70, thick flat to medium oblate in general shape with upper half flat to slightly tapered to a medium-size, well-filled neck and the lower half flat to slightly rounded in shape.

The outer intact dry scales soon after curing are medium in number, medium to thick, only fairly well retained in handling and storage, shiny medium purplish red (near 5 K 6) at midlength with the base slightly brighter (5 I 6) and more orange or buff toward the neck (5 K 4). Dry scales become dull and faded with age.

Epidermis of outer fleshy scales bright purplish red (53 K 10) with succeeding scales lighter (50 A 7 to 50 B 2) toward center. Flesh with epidermis removed is near white (50 A 1), but in cross section with epidermis in place the flesh is pale purplish pink (51 C 1) shading to near white in the center, soft to medium in firmness, strong in flavor, and medium in percentage of dry matter.

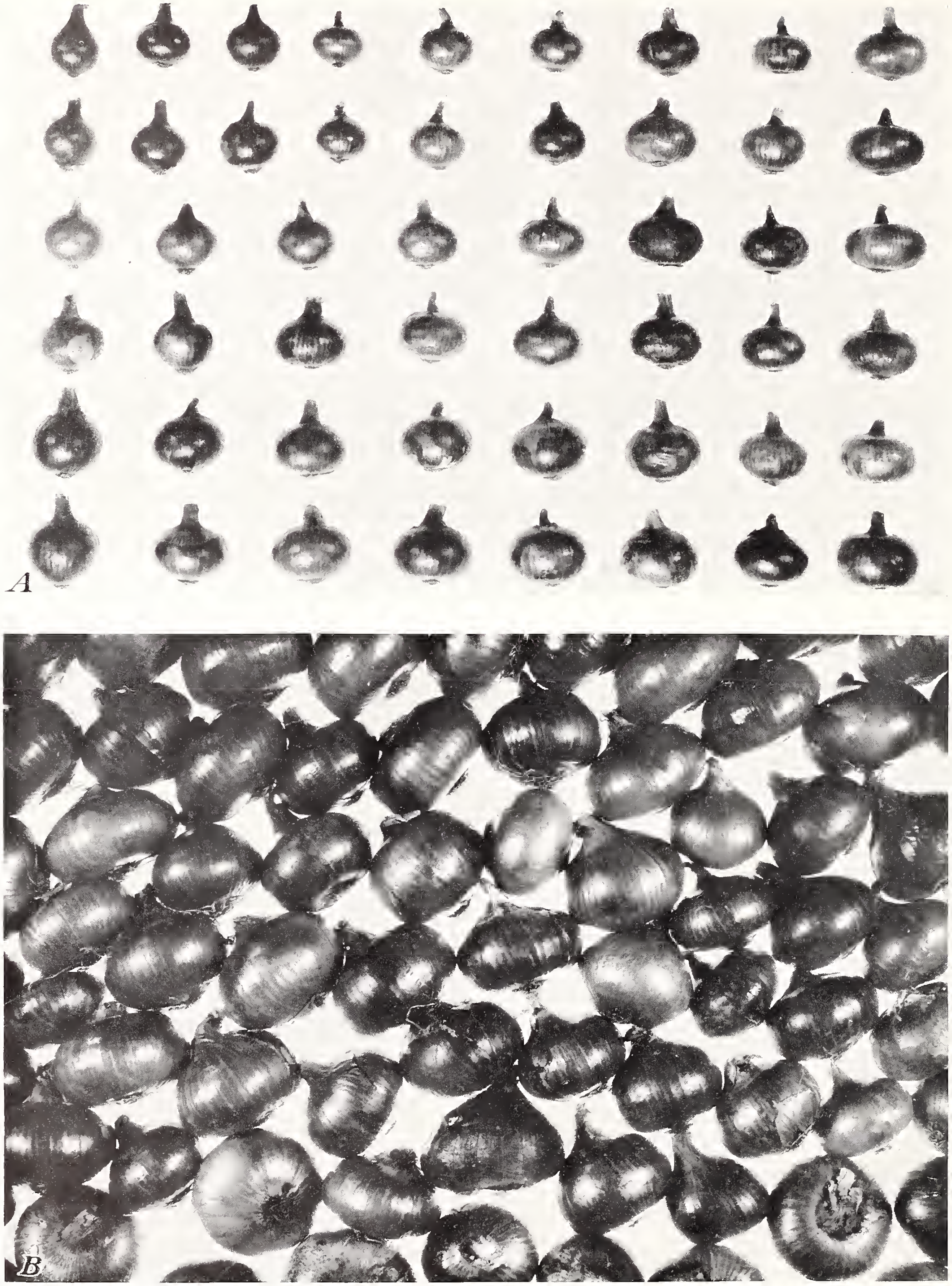
SYNONYMS

Blood Red Wethersfield, Dark Red Beauty, Extra Large Red Wethersfield, Globe Red Wethersfield, Globe Wethersfield Red, Improved Large Red Wethersfield, Large Red Wethersfield, New Oxblood Red Wethersfield, and Western Wethersfield.

HISTORY

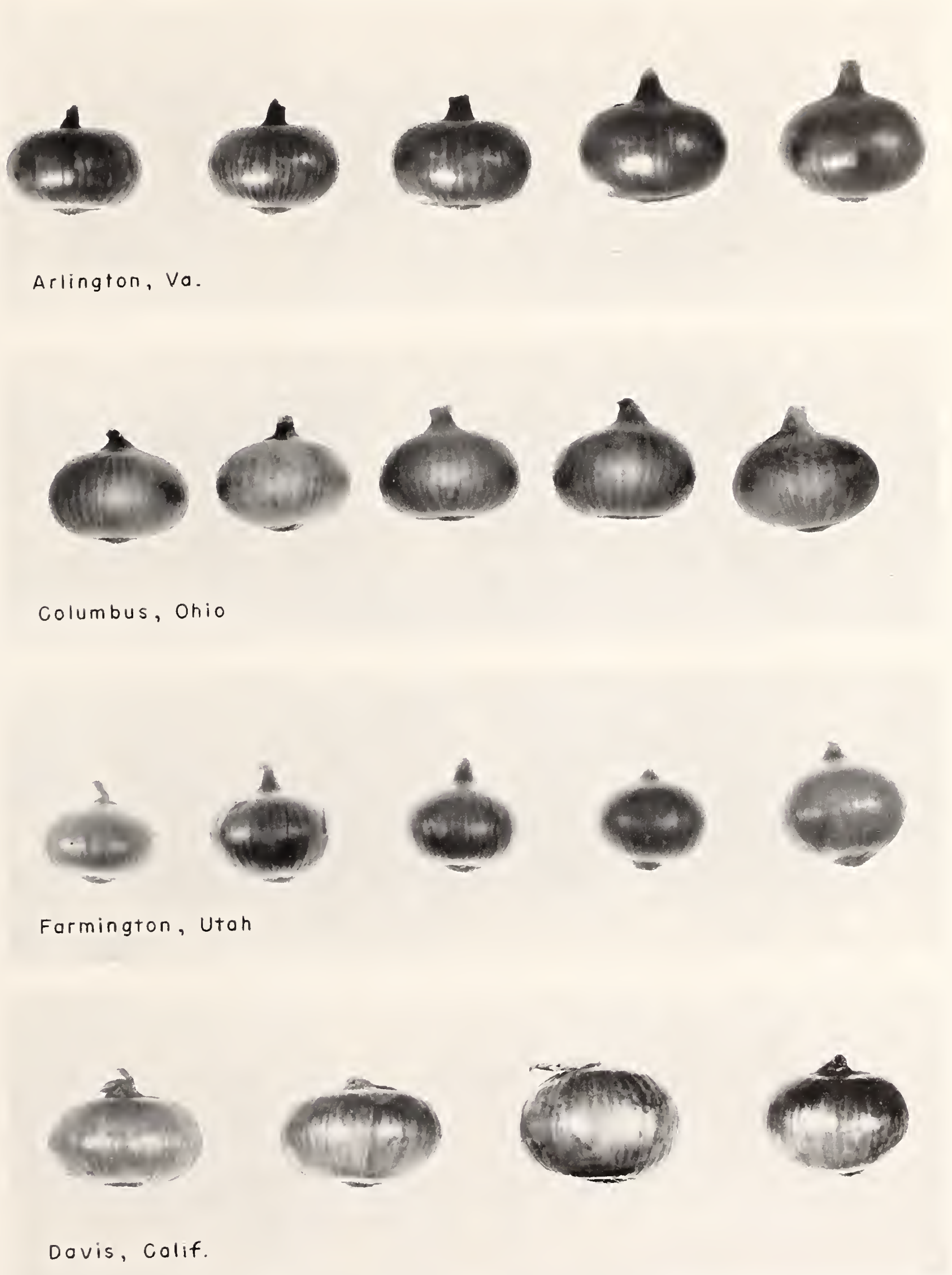
The name Wethersfield was first used in connection with this variety about 1852 by the American Seed Garden, of Wethersfield, Conn. It was listed as Large Red as early as 1834 by Hovey & Co., of Boston, and was developed by growers in the town of Wethersfield, Conn., from some unknown variety of European origin.

RED WETHERSFIELD ONION



Random samples of the same stock of Red Wethersfield onion grown (A) *at Arlington, Va.* (X 1/5), *and* (B) *at Terminus, Calif.* (X 1/3), *showing range in shape with size and location.*

RED WETHERSFIELD ONION



An acceptable range in type of large and very large bulbs of the same stock of Red Wethersfield onion grown in different locations and seasons. X 1/3. *The fourth bulb from the left in the Virginia range is most nearly ideal in shape.*

SOUTHPORT RED GLOBE

BRIEF CHARACTERIZATION

The most important red variety for the production of dry bulbs for market and the best for storage. Adapted to all northern onion-growing sections but not to the southern.

Midseason to late in maturity; the medium-size, round to oval-shaped bulbs have many, medium-thick, dark purplish red dry skins that are well retained during handling and storage. The flesh is firm or hard and strong or pungent in flavor.

ADAPTABILITY AND USE

Southport Red Globe is the best of the red varieties for storage and the most extensively used for this purpose in the Northern States where it is widely adapted. It does not mature properly in the Southern States and requires a long season in which to mature in the northern onion-growing States. The bulk of the crop is sold in southern markets where the discrimination in price against the color is not as great as in most northern markets. The flesh is firm and pungent and dark-colored when cooked.

SEASON

Midseason to late in maturity; when sown in December or January and set in the fields in late March in central California, maturity takes place the first week in August; when seed is sown in the greenhouse in December or January and the plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., about July 20, at Farmington, Utah, the first week in August, in north-central Ohio about August 10, and at Amherst, Mass., about August 20.

PLANT

Medium to tall; the longest leaves usually reaching an average height of 20½ to 27½ inches (52 to 70 cm.) at the maximum vegetative stage of maturity, with individuals as short as 13 inches (33 cm.) and as tall as 34½ inches (88 cm.).

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 7 to 11, depending largely upon the length and kind of growing season; longest leaf is from 18 to 24 inches (46 to 61 cm.) in average length in the Northern and Eastern States and 26 inches (66 cm.) in California; average width is seven-sixteenths to ten-sixteenths of an inch (11 to 16 mm.) and average depth is 65 to 85 percent of width. Mature leaves blue green, approximately 22 A to 23 A 6, but with heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art green): young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 1⅞ to 3⅛ inches (50 to 80 mm.) above the soil surface in the Northern and Eastern States and 4¾ to 6 inches (120 to 150 mm.) in California; midheight diameter averages fifteen thirty-seconds to twenty-one thirty-seconds of an inch (12 to 17 mm.) in the Northern and Eastern States and twenty-two thirty-seconds to twenty-seven thirty-seconds of an inch (18 to 22 mm.) in California. The outer succulent layer on young plants is very pale green (18 B 3) with darker green veins just below the leaves, but on older plants the basal portion soon becomes pinkish purple (43 D 2) with increasing depth of color to 45 G 3 toward the base and increasing with age and maturity. The tip of the outermost dry layer becomes faded buff or light brown with age, but the middle and basal portions above ground assume the dark blue purple (55 A 12) and metallic or bronzy purple characteristic of the mature bulb.

MATURE CURED BULB

(Fig. 1, pls. 1, 22, and 23)

Medium size: majority of bulbs, 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 2.3 to 4.5 ounces (65 to 125 g.), diameter divided by depth ratio of 0.85 to 1.25, oval to round in general shape with the upper half round to oval or slightly tapered to a small, well-filled neck and the lower half round to oval.

The outer intact dry scales soon after curing are many in number, thin to medium in thickness, very well retained during handling and storage, shiny dark purplish red (near 6 J 6) about the middle of the bulb with the base slightly lighter and the area about the neck sometimes bronzy dark red when soil-stained (pl. 1). Dry scales become dull and faded with age.

Epidermis of outer fleshy scales bright purplish red (53 K 10), lighter in color toward center (50 A 7 to 50 B 2), and almost white in the center. Flesh with epidermis removed is near white (50 A 1) in color but in cross section with epidermis in place the flesh is pale purplish pink (51 C 1) shading to near white in the center, fairly firm, strong in flavor, and medium in percentage of dry matter.

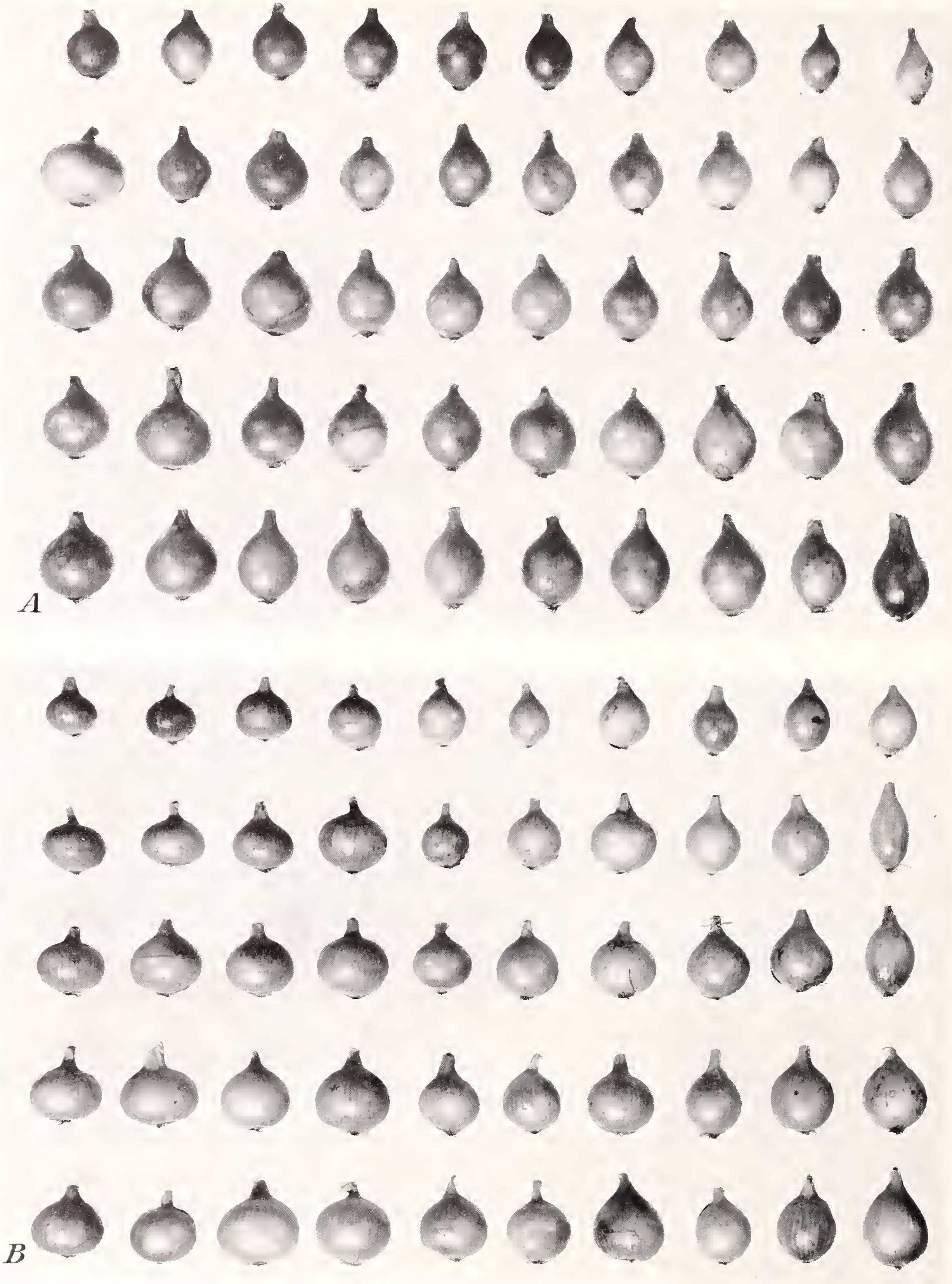
SYNONYMS

Crimson Globe, Great Cardinal, Improved Large Red Globe, Large Red Globe, Model Red Globe, Ohio Red Globe, Red Globe, Red Globe Dakota, Southport Large Red Globe, and Southport Late Red Globe.

HISTORY

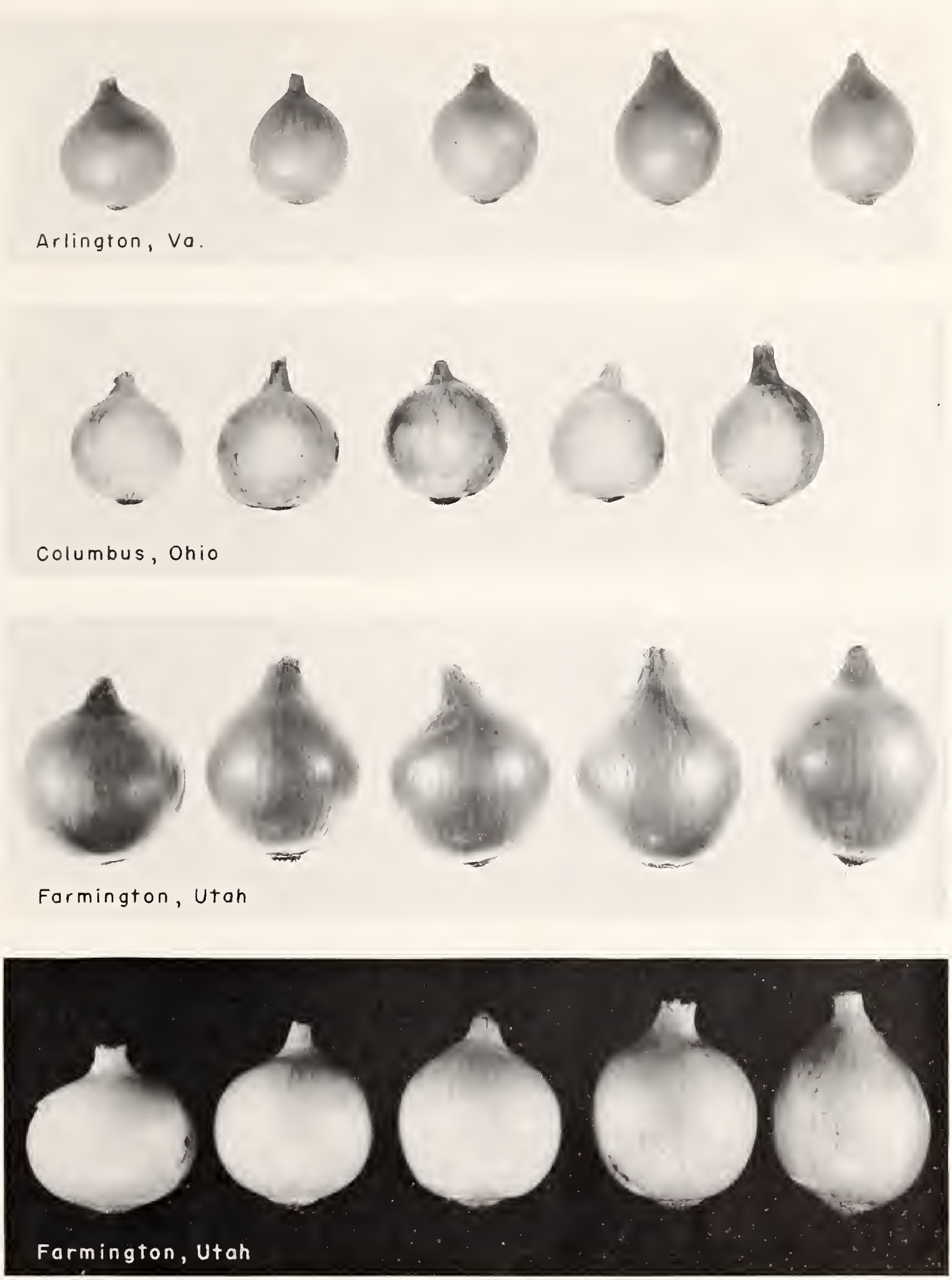
Probably a globular selection from the older variety Red Wethersfield. Large Red Oval or Globe was listed by B. K. Bliss in 1870 and in 1873 the name Southport Red Globe appeared in the catalog of James J. H. Gregory.

SOUTHPORT GLOBE ONION



A random sample of a good stock of (A) Southport Yellow Globe and (B) Southport White Globe as grown at Arlington, Va., showing slightly flatter shape of latter. X 1/5.

SOUTHPORT GLOBE ONION



Acceptable ranges in type of the same stock of Southport Yellow Globe onion grown at Arlington, Va., Columbus, Ohio, and Farmington, Utah, and of Southport White Globe (bottom range) grown at Farmington. X 1/3. *The third bulb from the left in the Ohio range is most nearly ideal in shape.*

SOUTHPORT WHITE GLOBE

BRIEF CHARACTERIZATION

The most important white variety for the production of dry bulbs for market and storage. Well adapted to all northern onion-growing sections but not to the southern.

Midseason in maturity; the medium-size, slightly flattened to slightly oval-shaped bulbs have many thin to medium-thick, shiny-white, dry skins that are well retained during handling and storage. The flesh is firm or hard and strong or pungent in flavor.

ADAPTABILITY AND USE

Southport White Globe is the most popular white variety for storage purposes as clean, good-condition bulbs of this variety usually command a premium on the market over either the red or yellow varieties of the same shape. It is difficult to produce first-class-condition bulbs because of the white color, which is easily spoiled by sunburn, greening, or soil discoloration. Very productive in all the Northern States and a long keeper when properly matured. Also extensively used in market and home gardens for the production of green bunch onions from seed. Less skinning is required to produce the desired white bulb or basal swelling, as there is no objectionable color in the outer skins. Not adapted to the Southern States because of length of day required for bulb formation. The firm, white, pungent flesh is used for all salad and culinary purposes. Particularly adapted for dehydration and manufacturing purposes, because of its high dry-matter content, lack of objectionable color, and high flavor or pungency.

SEASON

Midseason in maturity; when sown in December or January and set in the fields in late March in central California maturity takes place the last week in July; when seed is sown in greenhouses in December or January and the plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., about the middle of July, at Farmington, Utah, during the last week in July, in north-central Ohio during the first week in August, and at Amherst, Mass., about August 15.

PLANT

Medium to tall; the longest leaves usually reaching an average height of 20½ to 27½ inches (52 to 70 cm.) at the maximum vegetative stage of maturity, with individuals as short as 13 inches (33 cm.) and as tall as 34½ inches (88 cm.).

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 7 to 11 depending largely upon the length and kind of growing season; longest leaf is from 18 to 24 inches (46 to 61 cm.) in average length in the Northern and Eastern States and 26 inches (66 cm.) in California; average width is seven-sixteenths to ten-sixteenths of an inch (11 to 16 mm.) and average depth is 65 to 85 percent of width.

SHEATH COLUMN

Same size as Southport Red Globe. The outer succulent layer on young plants just below the leaves is very pale green (17 B 3) with slightly deeper green veins. As the outer layers age and become dry the green color fades out to a slightly yellowish white (17 B 1).

MATURE CURED BULB

(Pls. 22 and 23)

Medium size; majority of bulbs, 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 2.3 to 3.7 ounces (65 to 105 g.), diameter divided by depth ratio of 0.85 to 1.4, varying in shape from deep oblate to round to oval with the upper half round to oval or slightly tapered to a small, well-filled neck and the lower half round to oval in shape.

The outer intact dry scales soon after curing are many in number, medium in thickness, very well retained during handling and storage, glistening almost white when freshly exposed but becoming dull with age with light buff-colored veins around the neck. (See White Portugal, pl. 1.)

Fleshy scales almost white in color in cross section except where the bulbs have been exposed to strong light during curing, when the epidermis of the outer fleshy layers becomes pale green in color. Flesh fairly firm, strong in flavor, and high in dry matter.

SYNONYMS

Giant White Globe, Ideal White Globe, Large White Globe, Model White Globe, Ohio White Globe, Perfect White Globe, Silver Globe, Southport Large White Globe, and White Globe.

HISTORY

Southport White Globe originated in the Southport, Conn., onion-growing district, and White Globe, an early synonym, was listed in 1868 by R. D. Hawley, of Hartford. The geographical prefix was probably first used by James J. H. Gregory in his 1875 catalog.

SOUTHPORT YELLOW GLOBE

BRIEF CHARACTERIZATION

Probably the most important single variety of yellow onion for market and storage. Well adapted to all northern onion-growing sections but not to the southern.

Midseason to late in maturity; the medium-size, round to oval-shaped bulbs have many, medium-thick, medium-yellow, dry skins that are well retained during handling and storage. The flesh is firm or hard and strong or pungent in flavor.

ADAPTABILITY AND USE

Southport Yellow Globe is probably the most widely used yellow globe onion for storage. It is late-maturing, productive, and, when properly matured, keeps in storage for a long time. Extensively grown in the onion-producing sections north of the 36° parallel but not adapted to onion-growing sections south of this line. The firm flesh is pungent and used for all salad and culinary purposes.

SEASON

Midseason to late in maturity, usually 3 to 5 days later than Southport White Globe and 3 to 5 days earlier than Southport Red Globe.

PLANT

Medium to tall; the longest leaves usually reaching an average height of 20½ to 27½ inches (52 to 70 cm.) at the maximum vegetative stage of maturity with individuals as short as 13 inches (33 cm.) and as tall as 34½ inches (88 cm.).

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 7 to 11 depending largely upon the length and kind of growing season; longest leaf is from 18 to 24 inches (46 to 61 cm.) in average length in Northern and Eastern States and 26 inches (66 cm.) in California; average width is seven-sixteenths to ten-sixteenths of an inch (11 to 16 mm.) and average depth is 65 to 85 percent of width.

SHEATH COLUMN

Same size as Southport Red Globe. The outer succulent layer on young plants just below the leaves is very pale green (18 B 3) with darker green veins, but on older plants the basal portion becomes pale yellow (17 F 1). As the outer layers age and become dry they darken to 12 K 6 with the outermost somewhat lighter in color.

MATURE CURED BULB

(Pls. 1, 22, and 23)

Medium size; majority of bulbs, 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 2.3 to 4.5 ounces (65 to 125 g.), diameter divided by depth ratio of 0.85 to 1.25, oval to round in general shape with the upper half round to oval or slightly tapered to a small, well-filled neck and the lower half round to oval.

The outer intact dry scales soon after curing are many in number, medium in thickness, fairly well retained during handling and storage, shiny medium orange yellow (11 C 7) at midlength, with more yellow (9 E 2) toward the base and more brown (12 D 8) toward the neck. (Pl. 1.) The dry scales become duller and more brown with age.

Epidermis of outer fleshy scale pale yellow (10 H 1) in color with succeeding scales lighter yellow and the center almost white. Flesh with epidermis removed is near white, but in cross section with epidermis in place the flesh is very pale yellow (10 F 1) shading to near white in the center, fairly firm, strong in flavor, and medium in percentage of dry matter.

SYNONYMS

Golden Globe, Ideal Yellow Globe, Model Yellow Globe, New Wampum, Southport Large Yellow Globe, and Southport Yellow.

HISTORY

Large Yellow, which may have been a synonym of Southport Yellow Globe, was listed by James Vick in 1866 and Yellow Oval or Globe by Bridgeman in 1871. The name Southport Yellow Globe was probably first used by James J. H. Gregory and Peter Henderson in 1882.

BRIGHAM YELLOW GLOBE

A thicker and deeper-yellow scaled, long-keeping strain of Southport Yellow Globe type.

SWEET SPANISH

BRIEF CHARACTERIZATION

Especially adapted to culture in the irrigated sections of the western Mountain States and west coast States, although good crops may be produced by early sowing of seed or the use of green plants in other northern onion-growing sections. Fairly good bulbs may also be produced in the Southern States where the plants may be grown during the winter. Resistant to thrips damage and may be successfully stored for short periods if well cured.

Late in maturity; the medium- to large-size, round to slightly oval-shaped bulbs have many medium-thick, brownish-yellow dry scales that are fairly well retained during storage and handling. The flesh is fairly firm but of mild and sweet flavor.

ADAPTABILITY AND USE

Sweet Spanish is particularly adapted to regions that have a long, cool, growing season with a minimum day length in excess of 13 hours, high fertility and abundant rainfall or irrigation during the growing season, and a dry period during maturity. The best crops are therefore grown in irrigated sections of the western Mountain and west coast States, although good crops may be grown in certain of the northern onion-growing sections. Fair bulbs may also be produced in the Southern States where the plants may grow throughout the winter or where plants are set out early in the spring. Difficulty is sometimes encountered in curing the bulbs in northern sections when due to late maturity the bulbs ripen during the rainy periods of late fall. When properly matured the bulbs may be stored without great losses for several months, but it is not a long-storage variety. Its successful production of bulbs in many locations is partly due to its resistance to damage by thrips. It is greatly esteemed for salad purposes because of its succulent, sweet, mild-flavored, almost-white flesh.

SEASON

Late maturing; when sown in December or January and set in the fields in late March in central California, maturity takes place the first week in September; when sown in greenhouses in December or January and set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., during the first week of August, at Farmington, Utah, and in north-central Ohio about August 15, and at Amherst, Mass., about September 1.

PLANT

Tall; the longest leaves usually reaching an average height of 22 to 28½ inches (56 to 72 cm.) at the maximum vegetative stage of maturity, with individuals as short as 13 inches (33 cm.) and as tall as 37 inches (94 cm.).

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 7 to 13 depending largely upon the length and kind of growing season; longest leaf is from 19 to 26 inches (48 to 66 cm.) in average length in the Northern and Eastern States and 28 inches (71 cm.) in California; average width is one-half to three-fourths of an inch (13 to 19 mm.) and average depth is 65 to 85 percent of the width. Mature leaves light green, approximately 22 K 7, but with the slight bloom rubbed off the color is lighter green, approximately 21 K 7, with young or rapidly growing leaves about the same color.

SHEATH COLUMN

Oldest succulent leaf is from 1⅞ to 2⅛ inches (50 to 80 mm.) above the soil surface in the Northern and Eastern States and 4¾ to 6 inches (120 to 150 mm.) in California and Texas; midheight diameter averages nineteen thirty-seconds to twenty-five thirty-seconds of an inch (15 to 20 mm.) in the Northern and Eastern States and 15/16 to 1⅜ of an inch (24 to 30 mm.) in California and Texas. Succulent outer layers very pale green (18 B 3) with darker green veins, which, as the outer layers become dry, turn buff or light brown in color. The outermost dry layer becomes faded buff with age, whereas the successive dry layers assume the color characteristic of the mature bulb.

MATURE CURED BULB

(Fig. 1, pls. 1, 24, and 25)

Large size in the Northeastern States where the majority of bulbs are usually 2.5 to 3.0 inches in diameter (6.3 to 7.6 cm.), weight of 4.5 to 7.4 ounces (125 to 210 g.), diameter divided by depth ratio of 0.8 to 1.2 and round to oval in general shape. In irrigated sections of the Western States it reaches very large size, the majority of bulbs usually between 3.0 and 3.5 inches in diameter (7.6 to 8.9 cm.), weight of 7.4 to 12 ounces (210 to 340 g.), diameter divided by depth ratio of 0.9 to 1.3 and deep oblate to slightly oval in general shape. Upper half rounded to slightly tapering to medium-size but well-filled neck and the lower half slightly rounded to round in shape.

The outer intact dry scales soon after curing are medium to many in number, medium in thickness, and well retained during handling and storage, shiny, medium to brownish yellow (11 C 7) at midlength with lighter and more yellow color (10 G 4) at base and more reddish brown (12 C 8) toward the neck (pl. 1). The dry scales become dull and quite brown with age.

Epidermis of outer fleshy scale pale yellow (10 H 1) with succeeding scales lighter yellow and the center near white. Flesh with epidermis removed is near white (10 A 1), but in cross section with epidermis in place the flesh is very pale yellow (10 F 1) shading lighter to near white in the center, fairly firm, mild in flavor, and very low in percentage of dry matter.

SYNONYMS

Mountain Sweet Spanish, Mountain Valencia, Riverside Sweet Spanish, Utah Sweet Spanish, and Yellow Valencia.

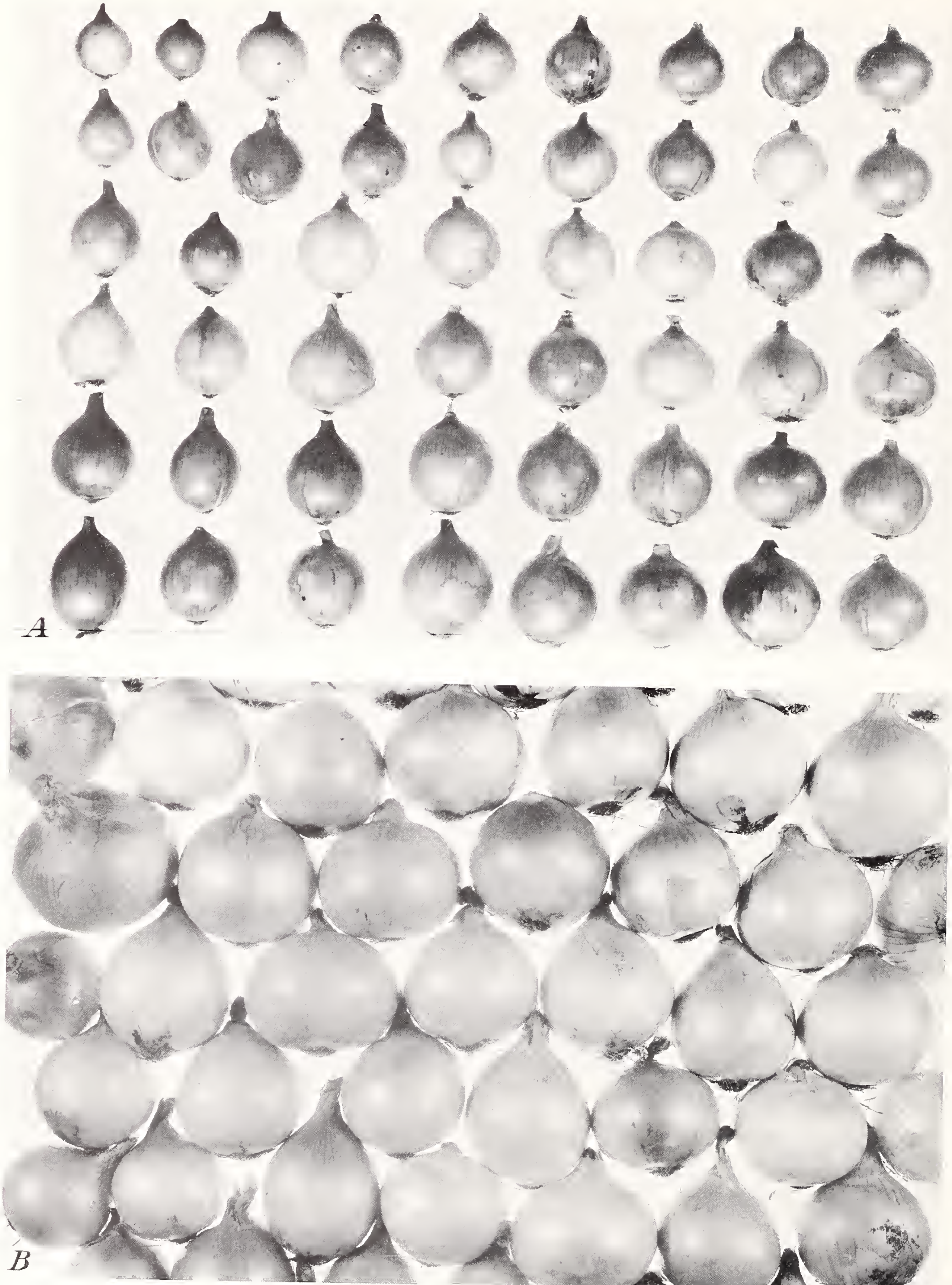
HISTORY

The type description is based on the Utah strain of Sweet Spanish developed by the Utah Agricultural Experiment Station from the Riverside Sweet Spanish, which in turn had been introduced from Spain in 1916 and subsequently improved and introduced by Aggeler & Musser, of Los Angeles.

WHITE SWEET SPANISH

Slightly earlier maturing and same shape or slightly flatter than Sweet Spanish with clear-white outer scales. Increasing in popularity and displacing Southport White Globe for bunching and dry-bulb purposes. Resistant to thrips damage and may be stored short periods if well cured.

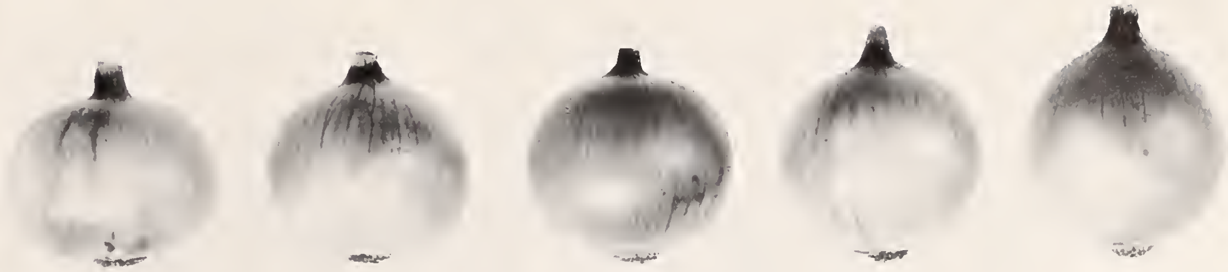
SWEET SPANISH ONION



Random samples of the same stock of Sweet Spanish onion grown (A) at Arlington, Va. (X 1/5), and (B) at Terminus, Calif. (X 1/3), showing range in shape with size and location.

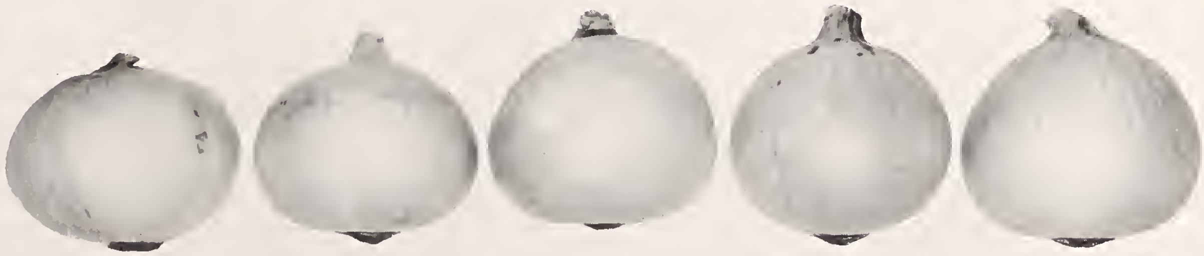
PLATE 25

SWEET SPANISH ONION

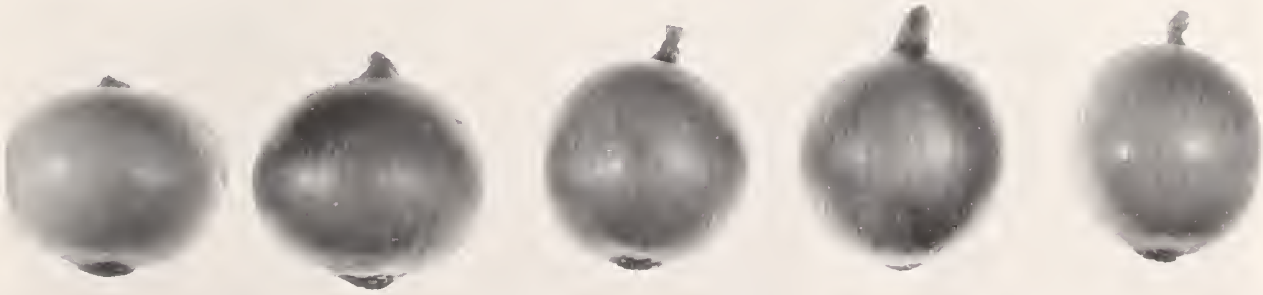


Arlington, Va.

Columbus, Ohio



Columbus, Ohio



Farmington, Utah

An acceptable range in type of large and very large bulbs of the same stock of Sweet Spanish onion grown in different locations and seasons. X 1/3. *The third bulb from the left in the Virginia range is most nearly ideal in shape.*

WHITE PORTUGAL

BRIEF CHARACTERIZATION

The most widely used white variety for the production of dry sets. Small onions are used for pickling purposes. Well adapted to all northern onion-growing sections but not the southern. A very good storage variety but not as productive as Southport White Globe.

Late in maturity; the small to medium-size, oblate or slightly flattened bulbs have many, medium-thick, shiny-white, dry skins that are fairly well retained during storage and handling. The flesh is firm or hard and very strong or pungent in flavor.

ADAPTABILITY AND USE

White Portugal is the most widely used variety for the production of white sets and pickling onions, as the small sets are nearly round and store well for long periods. The acreage of dry bulbs grown from seed is small and limited largely to market-garden crops that are not used as green bunch onions, a purpose for which this variety is desirable because of the ease of preparation for market. Adapted to all of the northern onion-growing sections but not to the Southern States. The hard, white flesh is very pungent, high in percentage of dry matter, and used for all culinary purposes.

SEASON

Midseason in maturity; when sown in December or January and set in the fields in late March in central California, maturity takes place the last week in July; when seed is sown in greenhouses in December or January and the plants set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., about the middle of July, at Farmington, Utah, during the last week in July, in north-central Ohio during the first week in August, and at Amherst, Mass., about August 15.

PLANT

Medium height; the longest leaves usually reaching an average height of 19½ to 25½ inches (50 to 65 cm.) at the maximum vegetative stage of maturity, with individuals as short as 12 inches (30 cm.) and as tall as 31½ inches (80 cm.).

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 7 to 11 depending largely upon the length and kind of growing season; longest leaf is from 18 to 24 inches (46 to 61 cm.) in average length in Northern and Eastern States and 26 inches (66 cm.) in California; average width is seven-sixteenths to ten-sixteenths of an inch (11 to 16 mm.) and average depth is 65 to 80 percent of the width. Mature leaves blue green, approximately 22 A 6 to 23 A 6, but with the heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 1½ to 2⅜ inches (40 to 60 mm.) above the soil surface in the Northern and Eastern States and 4 to 4¾ inches (100 to 120 mm.) in California; midheight diameter averages four-eighths to five-eighths of an inch (13 to 16 mm.) in the Northern and Eastern States and eighteen thirty-seconds to twenty-five thirty-seconds of an inch (14 to 20 mm.) in California. The outer succulent layer on young plants just below the leaves is very pale green (17 B 3) with slightly deeper green veins. As the outer layers age and become dry the green color fades out to a slightly yellowish or pinkish white (17 B 1).

MATURE CURED BULB

(Pls. 1, 26, and 27)

Medium size (diameter); majority of bulbs 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 1.6 to 3.2 ounces (45 to 90 g.), diameter divided by depth ratio of 1.25 to 1.75, flat oblate to medium oblate in general shape with the upper half slightly rounded to slightly tapered to a medium-size, well-filled neck and the lower half flat to slightly rounded.

The outer intact dry scales soon after curing are many in number, medium in thickness, and fair to good in retention during handling and storage, shiny white when freshly exposed but becoming dull with age with light buff-colored veins around the neck (pl. 1).

Epidermis of outer fleshy scales near white (10 A 1) except where the bulbs have been exposed to strong light during curing when the epidermis becomes pale green with succeeding scales near white toward the center. Flesh with epidermis removed or in place is near white in color, firm, very strong in flavor, and high in percentage of dry matter.

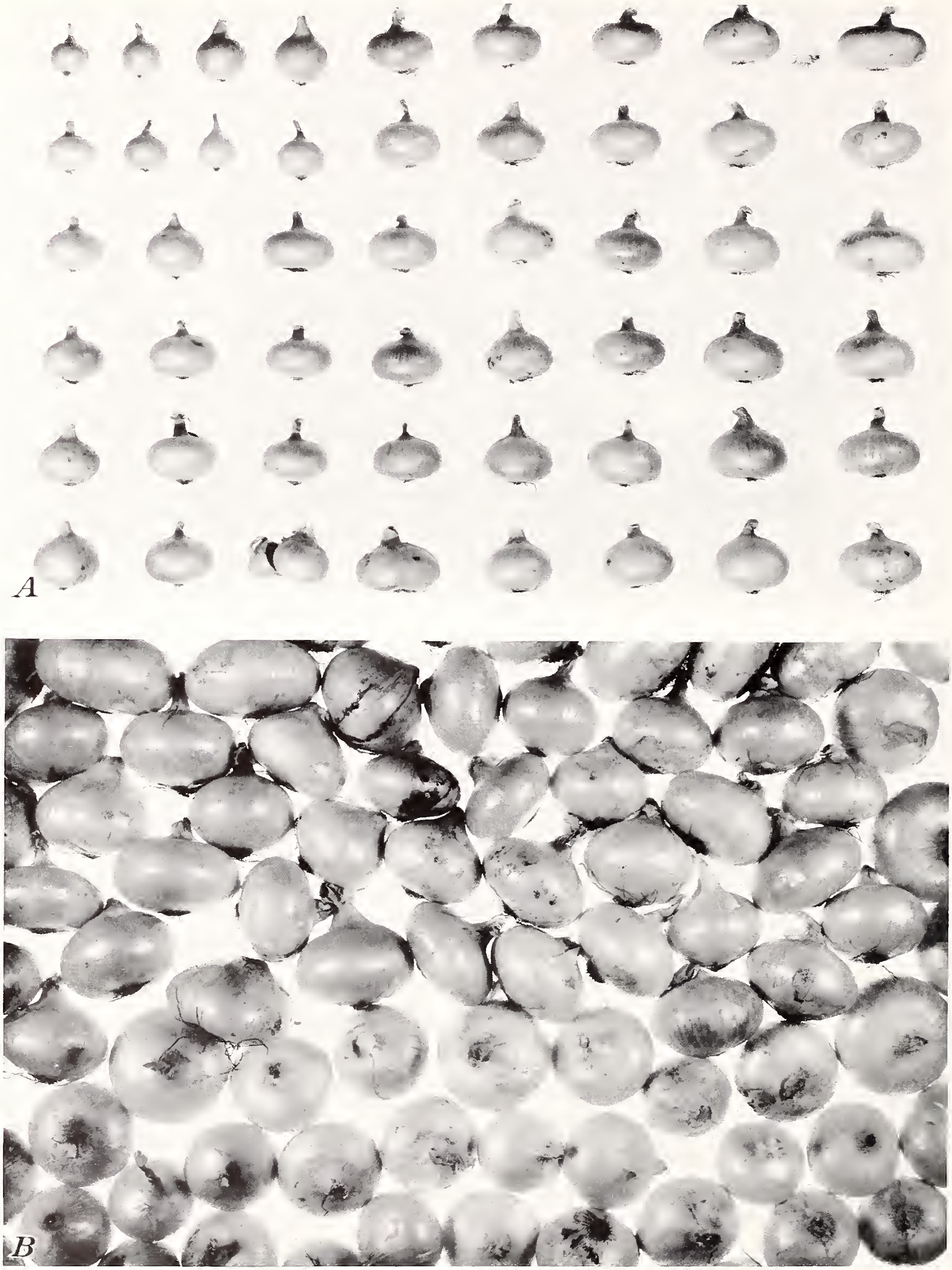
SYNONYMS

American Silver Skin, American Silverskin, Indiana Silverskin, Large White Portugal, Mammoth Silverskin, New England White, Philadelphia White, Philadelphia White Silverskin, Round White Silverskin, Silverskin, Silver Skin, Small Silver Skin, White Skin, and White Silverskin.

HISTORY

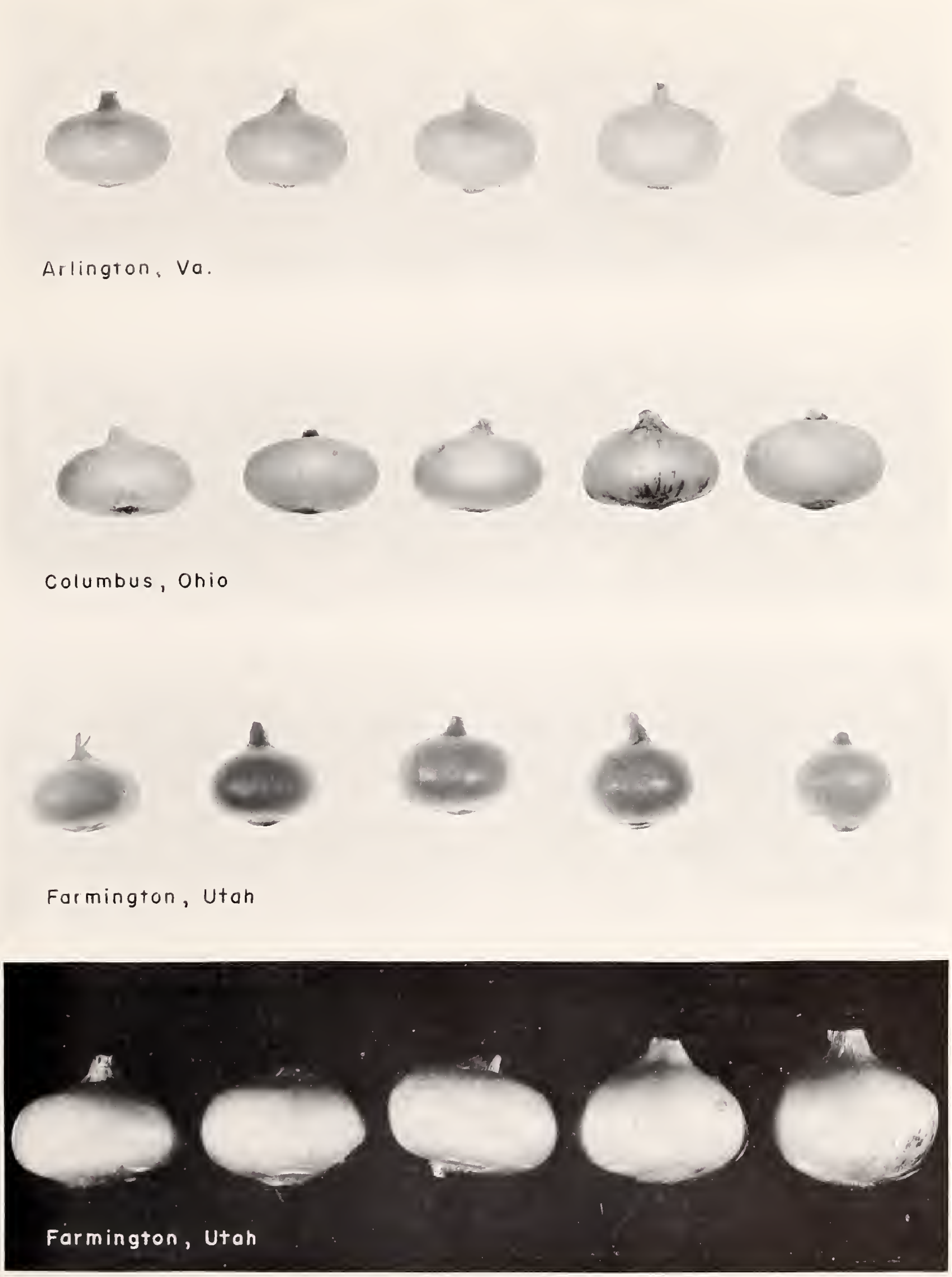
A very old European variety that probably was imported with the first shipments of vegetable seeds. The variety is included in the list of imported seeds offered for sale by Minton Collins, of Richmond, Va., in 1793.

WHITE PORTUGAL ONION



Random samples of the same stock of White Portugal onion grown (A) at Arlington, Va. (X 1/5), and (B) at Terminus, Calif. (X 1/3), showing range in shape with size and location.

WHITE PORTUGAL ONION



An acceptable range in type of large and very large bulbs of the same stock of White Portugal onion grown in different locations and seasons. X 1/3. *The second or third bulb from the left in the Virginia range is most nearly ideal in shape.*

YELLOW GLOBE DANVERS

BRIEF CHARACTERIZATION

A very good storage, midseason variety but surpassed in yield by later maturing varieties and also by the slightly earlier maturing Early Yellow Globe. Adapted to all northern onion-growing sections but not the southern.

Midseason in maturity; the medium-size, slightly flattened to round bulbs have many medium-thick, brownish-yellow dry scales that are well retained during storage and handling. The flesh is firm or hard and strong in flavor.

ADAPTABILITY AND USE

Yellow Globe Danvers is one of the best storage varieties and matures in midseason. At one time it was the most important yellow variety in New York and New England, but with the introduction of Ebenezer and Early Yellow Globe it is rapidly losing favor to them. It is adapted to most of the northern onion-growing sections but is surpassed in yield by later-maturing varieties where they can be matured. Not adapted to the Southern States. The flesh is firm, pungent, and used for all culinary purposes.

SEASON

Midseason in maturity; when sown in December or January and set in the fields in late March in central California maturity takes place the last week in July; when seed is sown in greenhouses in December or January and the plants are set in the field as soon as possible, maturity is reached in the vicinity of Washington, D. C., about the middle of July, at Farmington, Utah, during the last week in July, in north-central Ohio during the first week in August, and at Amherst, Mass., about August 15.

PLANT

Medium height; longest leaves usually reaching an average height of 18 to 26 inches (46 to 66 cm.) at the maximum vegetative stage of development with individuals as short as 13 inches (33 cm.) and as tall as 34 inches (86 cm.).

LEAVES

Just prior to ripening, the average number of functional leaves over 2 inches in length varies from 7 to 11 depending largely upon the length and kind of growing season; longest leaf is from 17¼ to 24 inches (44 to 61 cm.) in average length in the Northern and Eastern States and 26 inches (66 cm.) in California; average width is seven-sixteenths to ten-sixteenths of an inch (11 to 16 mm.) and average depth is 70 to 85 percent of the width. Mature leaves blue green, approximately 22 A 6 to 23 A 6, but with the heavy bloom rubbed off the color is brighter green, approximately 22 L 7 (Art Green); young or rapidly growing leaves still lighter green.

SHEATH COLUMN

Oldest succulent leaf is from 1½ to 2¾ inches (40 to 70 mm.) above the soil surface in the Northern and Eastern States and 4 to 4¾ inches (100 to 120 mm.) in California; midheight diameter averages fifteen thirty-seconds to twenty thirty-seconds of an inch (12 to 16 mm.) in the Northern and Eastern States and twenty-one thirty-seconds to twenty-seven thirty-seconds of an inch (17 to 22 mm.) in California. The outer succulent layer just below the leaves on young plants is very pale green (18 B 2) with darker green veins but on older plants the veins become yellowish brown with a light-yellow suffusion between them. As the outer layers age and dry the color deepens to yellowish buff.

MATURE CURED BULB

(Pls. 1, 28, and 29)

Medium size; majority of bulbs, 2.0 to 2.5 inches in diameter (5.1 to 6.3 cm.), weight of 2.1 to 3.7 ounces (60 to 110 g.), diameter divided by depth ratio of 1.0 to 1.5, round to deep oblate in general shape with the upper half round to slightly tapered to a small, well-filled neck and the lower half slightly rounded to round.

The outer intact dry scales soon after curing are many in number, medium in thickness, well retained during handling and storage, shiny brownish yellow (11 B 9) at midlength with more yellow (9 E 2) toward the base and more brown (12 C 10) toward the neck (pl. 1). The entire bulb becomes duller and more brown with age.

Epidermis of outer fleshy scales pale yellow (10 H 1) in color with succeeding scales lighter yellow and the center almost white. Flesh with epidermis removed is near white in color, but in cross section with epidermis in place the flesh is very pale yellow (10 F 1) shading to near white in center, fairly firm, strong in flavor, and medium in percentage of dry matter.

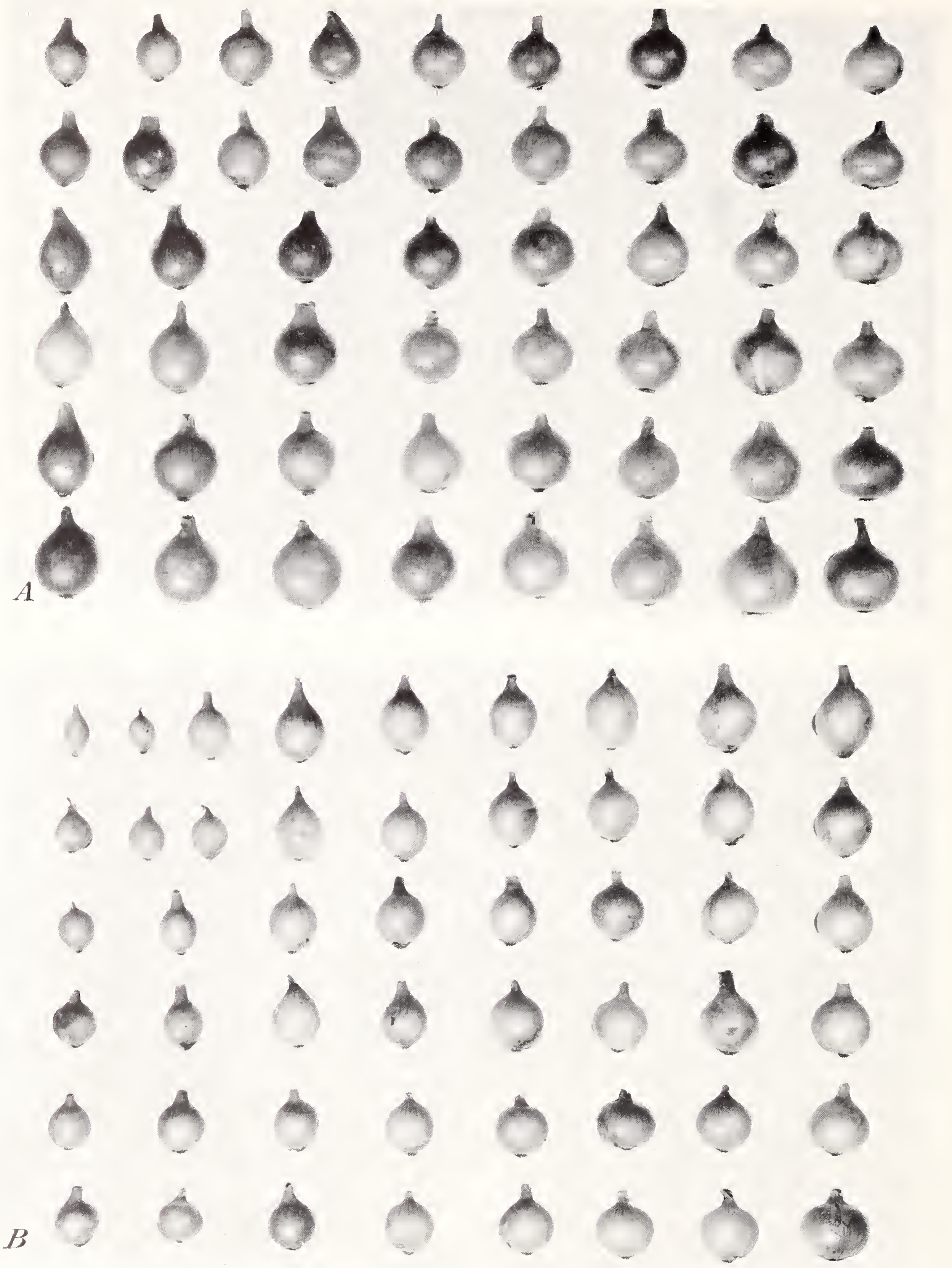
SYNONYMS

Colorado Bronze Globe, Danvers Fine Yellow, Danvers Yellow Globe, Golden Globe Danvers, Improved Large Yellow Danvers, Improved Yellow Globe, Oregon Yellow Danvers, Oregon Yellow Globe, Round or Yellow Danvers, Round Yellow Danvers, Superior Golden Globe, Yellow Beauty, and Yellow Round Danvers.

HISTORY

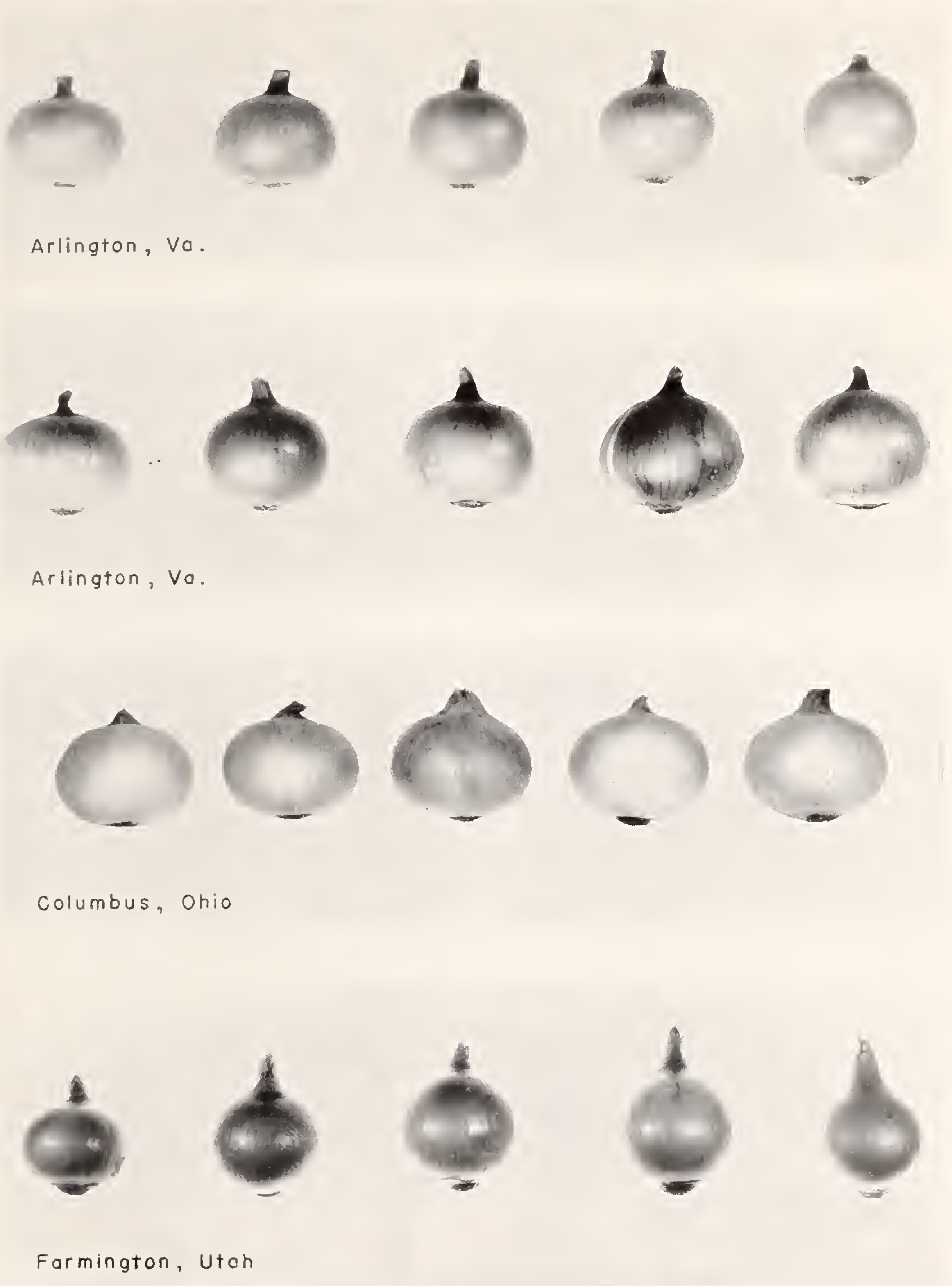
The Danvers Yellow or Yellow Danvers variety of onion was developed by years of selection of the earlier ripening, deeper bulbs from the old Common Yellow or Silverskin of New England variety by the growers of Essex County in Danvers and Peabody, Mass. It was distributed outside of these towns sometime before 1850 and soon attained prominence enough to be listed in seed catalogs. It was included in the 1852 list of the American Seed Gardens of Wethersfield, Conn., under the name of New Danvers Yellow and in 1868 by R. D. Hawley of Hartford, Conn., as Danvers Yellow Globe. Two strains differing in shape have been in existence since the first printed mention of the name, but the deeper or rounder of the two has become the more important, especially since the introduction of the Ebenezer variety has almost displaced Yellow Danvers Flat for the production of onion sets.

YELLOW GLOBE DANVERS ONION



Random samples of the same stock of Yellow Globe Danvers onion showing the difference in size and shape when grown in a favorable season (A) as compared with an unfavorable season (B) at Arlington, Va. X 1/5.

YELLOW GLOBE DANVERS ONION



An acceptable range in type of large and very large bulbs of the same stock of Yellow Globe Danvers onion grown in different locations and seasons. × 1/3. *Second or fifth bulb from the left in the second range from the top is most nearly ideal in shape.*

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